PSYCHOLOGY AS SCIENCE

ITS PROBLEMS AND POINTS OF VIEW

BY

H. P. WELD

CORNELL UNIVERSITY

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TO

WALTER PLATT COOKE

PREFACE

In this book I have tried to distinguish the logical approaches to and the fundamental problems of scientific psychology; in other words, to show what psychology considered as science is thinking and doing. In thus limiting the inquiry to psychology considered as science, I have ignored concepts characteristic of popular psychology, and problems which belong to philosophical psychology. On the other hand, I have been unable to avoid a study of the meaning of science; and, since psychology of recent years has entered the field of application, of technology.

My attitude in preparing the book has, on the whole, been something like that of a reporter who selects what seems significant for his purpose and reports, as sympathetically as he can, what he finds. I have, in general, avoided internal criticism because it has seemed to me that the greater present need is understanding. Psychology is still individualistic; no two systems are alike, and differences are emphasized. There are, nevertheless, many uniformities; systems differing widely in detail often have the same goal, the same problems, and the same methods. I have sought out these uniformities and tried to put the differences in perspective so that psychology considered as science may be viewed as a whole.

The book was first written two years ago and it has twice been mimeographed for use in a second course in introductory psychology. In this form it has served both

as a background for a lecture course and as a guide to topical reading in psychology. The references have been selected with several ends in view. Some, which are almost invariably in English, substantiate and amplify the text, or provide supplementary reading of a general kind; others, which are frequently in foreign languages, are intended as sources for special investigation and may be useful in an advanced course.

My obligations are numerous. In all stages of the book's preparation, my wife, Martha Robinson Weld, has been my collaborator. What I owe to my late colleague, Edward Bradford Titchener, I do not in the least know how to acknowledge adequately. Ten years ago I read a chapter on the meaning of science which he had written but which is not yet published; and his thought has served me as a guide to the interpretation of a difficult literature. Had it not been for circumstances following upon his death, the publication of this book would have been delayed until his work had appeared. I am also under debt to him in many less tangible ways; whatever this work has by way of clear thinking, historical perspective, and sympathetic insight into various points of view is largely a reflection of the influence which his method in scholarship has had upon me. My colleagues, Professor L. B. Hoisington, Professor F. L. Bixby, Professor J. P. Guilford, Dr. S. Feldman, Mr. G. Kreezer, and Mr. D. T. Griffin, have used the book in their classes and have made valuable suggestions for its improvement; to Dr. Feldman, in particular, I have constantly turned for advice and criticism. Miss E. R. Moul has verified many of the references; Miss Osea Calciolari has typed the manuscript; and Dr. Cleve-

land Abbe, Jr., has rendered expert service to manuscript and proofs.

While I agree with Bacon that "books such as are worthy of the name of books ought to have no patrons but truth and reason," this work has its patron in my friend Walter Platt Cooke, and I dedicate it to him.

H. P. W.

Ithaca, N. Y.,
December, 1927.

TABLE OF CONTENTS

PSYCHOLOGY AS SCIENCE
ITS PROBLEMS AND POINTS OF VIEW

CHAPTER I

THE MEANING OF SCIENCE

I agree with you in thinking that new definitions of terms are not always necessary to get at the truth; and that the most exact definitions are not so much the causes as the consequences from our advances in knowledge. At the same time, I should say, that in regard to this latter position, they act and react upon each other, and without some understanding as to the meaning of words used, the advance in knowledge would be quite slow, though it still might be quite true that you would not arrive at the very best definitions, till a very great progress had been made.—WILLIAM WHEWELL.

We find that nearly all the leading ideas employed in scientific theory and explained in the scientific text-books have either been replaced or remodelled.—JOHN THEODORE MERZ.

1. Introduction. We propose, in this book, to investigate the problems and points of view of psychology regarded as science. Our inquiry will extend over the entire range of the subject. We shall begin with General Psychology where we shall find typical definitions of psychology in general, and statements of its methods and problems. We shall then pass on to the special psychologies—animal, child, differential, and social psychology, the psychology of the abnormal, and the applied psychologies. In every case we shall apply the fundamental definitions and methods which we have found in General Psychol-

ogy, and in addition consider any special problem that may arise. We shall not, of course, attempt to give all the facts of these special fields. When additional facts are needed we shall have recourse to other books.

If, however, we are fully to understand psychology as science, we must first investigate the meaning of *science.* The task will not be easy because, although science has added enormously to the sum-total of our knowledge during the last two centuries, it did not at the beginning have a clear understanding of what it was doing, and as its results multiplied its concepts required restatement. It was, indeed, not until a "very great progress had been made" that the fundamental distinction between the scientific and the nonscientific views of the world became realized. There are, therefore, two conceptions of science: the traditional, which represents the present-day popular notion; and the critical, which results from recent studies made in the light of what science has done and is doing. We shall have to investigate both these views, and we commence, naturally, with the former.

2. The traditional notion of science. The term "science," originally employed in English literature as a synonym for "knowledge," first acquired the more special meaning of a certain kind of practical knowledge, *e. g.*, the "science of fencing," and then about the end of the 17th century was occasionally applied

in the sense of "exact knowledge" to the "new learning" which, largely as a result of the writings of Francis Bacon and the researches of Isaac Newton, was rapidly developing in France and in England. This "new learning" was regarded as exact knowledge in contrast to the speculative knowledge of traditional philosophy; its method was to begin with observed facts, and by the logical method of induction to arrive at general principles or laws which should be valid for all particular facts subsumed under them; and it undertook also to explain natural occurrences by ascertaining their causes. This use of the term "science," indigenous in France, grew slowly in England where the term "natural philosophy" was preferred, and did not gain general acceptance until the beginning of the 19th century. By this time, however, its meaning had broadened. The achievement of science that seemed the most brilliant, and the one, therefore, that caught the imagination of scholars, was its apparent ability not only to explain past and present events but even to predict future occurrences in nature. Thus the notion of prediction became embodied in the traditional conception of science. Furthermore, since the laws and hypotheses of science which make explanation and prediction possible are wrought by the exercise of human reason, induction came to be regarded as the specific method of science, and the observation of facts as nothing more than the recognition of phenomena.

3. The traditional classification of the sciences. Finally, by the close of the last century, the general body of science was regarded as consisting of a number of single and separate sciences, and *a science* as dealing with a particular subject matter. Physics, which in the 17th century meant the "phenomena of nature," became restricted during the 18th century to inorganic nature, and divided into pure physics (the properties of matter and energy), chemistry (the constitution of matter), astronomy (the phenomena of the heavenly bodies), geology (the structure of the earth), and the like. In the first half of the 19th century "biology" came into use for the science of living things, and in the last half of the same century "psychology" was added as the science of mental phenomena. But the differentiation did not stop here; if the sole method of science is induction there would seem to be no reason why science should be limited to nature; any subject matter might become a science, and so history, political economy, mathematics, logic, and ethics are sometimes called sciences.

4. The methods of traditional science. Thus the traditional notion of science has grown. It has been sketched too briefly, and there are certain implications in it that should be made clear. Although it is said that the facts of science are obtained by observation, both the facts themselves and the attitude of observation are identified with those of everyday life.

In other words, no distinction is made between scientific and other facts, or between scientific and ordinary observation. Thus we find Huxley, Spencer, and others saying that "science is perfected commonsense,"[1] that "science and ordinary knowledge are allied in nature—the one is but the extended and perfected form of the other,"[2] and a more recent writer characterizing observation as the "mere sensory recognition of any phenomenon."[3] It follows that the characteristic achievement of science is obtained by its logical methods; for it is only in this way that science may be "perfected." "The very difference," writes Case, "between ordinary and scientific knowledge is that while the former is sporadic, the latter is systematic."[4]

5. The problem of traditional science. The problem of traditional science is to furnish a theory of nature by way of the *explanation* of occurrences in nature, the determination of causes, the answering of the question, Why? "The first thing," writes Herschel, "that a philosophic mind considers, when any new phenomenon presents itself, is its *explanation*,

[1] T. H. Huxley, *Science Primers; Introductory*, 1880, 18 f.

[2] H. Spencer, "The Genesis of Science," in *Essays*, ii, 1891, 8.

[3] F. Gotch, "On Some Aspects of Scientific Method," in *Lectures on the Methods of Science*, ed. by T. B. Strong, 1906, 28.

[4] T. Case, "Scientific Method as a Mental Operation," in *Lectures . . .*, ed. by T. B. Strong, 1906, 4.

or reference to an immediate producing cause. If that cannot be ascertained, the next is to *generalize* the phenomenon, and include it, with others analogous to it, in the expression of some law, in the hope that its consideration in a more advanced state of knowledge, may lead to the discovery of an adequate proximate cause."[5] This concept has, at the hands of many men of science, led to an explanatory theory covering the whole of a science. Hence, we find it stated that physics is a mechanistic science, that the physical world is like a machine, constructed of interconnecting and interacting parts, all of which are causally related. Things happen as they do by necessity; the universe is *governed* by laws, and science discovers these laws. The same concept has also been applied to biology and psychology. In the former it has been opposed by another theory called vitalism which posits a vital principle to explain either the whole of biological phenomena or, where mechanism seems to fail, to supplement it. In psychology, where a mechanistic explanation is difficult, a hypothetical psychic energy replaces physical energy, or an association of ideas regarded as a "gentle force" is substituted for physical force, and in this way a mechanistic doctrine is constructed for the explanation of the whole of mental phenomena. Although it is held by other men of science that such attempts as these are

[5] J. F. W. Herschel, *Discourse on the Study of Natural Philosophy*, 1831, 107 ff.

philosophical and transcend the limits of science, there can be no question that this conception is characteristic of traditional science.

6. The goal of traditional science. The goal of traditional science is ultimately to bring the universe under control for the benefit of humanity. "The real and legitimate goal of the sciences," declares Bacon, "is the endowment of human life with new inventions and riches;"[6] and this view is still accepted in popular thinking. Nevertheless, within science itself, the question, *cui bono*, has been a perennial source of dispute. Galileo was forced to defend the discoveries by Copernicus and by himself against this accusation.[7] Herschel also, two hundred years later, answered the same question by insisting upon the "lofty and disinterested pleasure"[8] in scientific pursuits and, if further justification were needed, by pointing to the fact that speculations which appeared most unprofitable often resulted in "the greatest practical applications." Similar replies were returned by Whewell,[9] Huxley,[10] and still later by Dar-

[6] F. Bacon, *Novum Organum*, i, Axioms, 81, 103.

[7] G. Galilei, *Opere*, Nazionale ed., 1897, vii, 394; Dialog ueber die beiden hauptsächlichsten Weltsysteme, transl. by E. Strauss, 1891, 384.

[8] J. F. W. Herschel, *op. cit.*, 8 ff.

[9] Wm. Whewell, *Philosophy of Discovery*, 1860, 143, 210.

[10] T. H. Huxley, "The Progress of Science, 1877." Reprinted in *Essays: Methods and Results*, 1894, 44–54.

win who called the whole history of science to witness.[11] This difference of opinion is worth noting because it shows that not all men of science accepted all the tenets of the prevailing view about science.

7. The critical conception of science. Throughout its history science has aimed at accurate knowledge. Its observations must, therefore, be made with the utmost care, and its inductions reached by means of the most rigorous logic. This self-imposed requirement of science has, however, forced certain limitations upon its activities; it cannot, for example, attempt the solution of a problem for which its methods are inadequate, or the results of which are incapable of scientific proof. As a consequence of its ideals and limitations science must be critical of its aims, its powers, its methods and results. The traditional notion of science is, as we have seen, Baconian in its conception, and so great was the authority of Bacon that until a century ago criticism was limited almost entirely to the results of science—*i. e.*, to its facts, laws, and theories. It is only during recent times that the dicta of Bacon as regards the aims, powers, and methods of science have seriously been called into question. It is perhaps premature to attempt an expression of all of the answers to these inquiries; for agreement on some of them has hardly been reached. The trends, however, are unmistakable, and their

[11] F. Darwin, ed., *More Letters of Charles Darwin*, ii, 1903, 441.

final formulation will doubtless be in the direction of greater clearness of statement rather than of change in meaning.

It is now said that the facts of science are not, as traditionally supposed, the same as the declarations of common sense. The essential difference between the two is that the latter are always *values* and the former are always *facts*. The values of common sense are in their essence good or bad, ugly or beautiful, valuable or worthless for man, whereas the facts of science are observational findings expressed in purely qualitative or quantitative terms without regard to their value for humanity. Behind this summary statement there lies much hard thinking, some of which we must undertake.

We must, in the first place, distinguish between the *subject matter* and the *facts* of science. The subject matter is whatever it is that is described, and the facts are the descriptions. The subject matter of science is sometimes characterized as the "natural," or the "external," or "existential" world; at other times it is said to be the whole of experience as considered from a special point of view. Although the latter is perhaps the more accurate form of statement, we may better first consider the former. Negatively, this world is not the familiar world of common sense; it may, however, be represented as the familiar world stripped of its beauty, utility, and other ulterior meanings with which common sense clothes it. It is not,

either, that "real" world which common sense conceives as existing somehow quite independent of human experience; since science is limited solely to what is given in this experience, the terms "external" and "existential" should carry no implication of reality except in so far as the experience itself is real. Positively, the world of science is that world about us which is visible, audible, palpable, *i. e.*, it is a perceptual, an observable world; it is in this sense that it is sometimes called the "external" world. Finally, it is a world that is given in experience; we cannot change it by taking thought, we cannot argue it away, we are forced to accept it as it is. The world of science is, therefore, sometimes called the "existential" world.

This reference to the subject matter of science as a world of a particular kind may, however, be misleading. It may suggest that science began by distinguishing a world of value and a world of existence. Nothing could be further from the truth. Science deals, and from the beginning has dealt, with the whole of experience from a particular point of view. The result of this is that one phase of experience is observed and all others remain invisible. What to the man of science is invisible may be seen only by taking another, a non-scientific point of view. The chemist who, for example, undertakes the description of that bit of experience familiarly known as the diamond, can see only that aspect of experience which is

observable, which is describable, which supplies the answer to the question, what are you? or what is your nature? He cannot, as man of science, see its rarity, its beauty, its commercial value, or its familiar meaning. In order to see any one of these the same individual must drop the scientific and assume another attitude, one that is evaluative, one that seeks an answer to some such question as, what kind of an object are you? what good are you? what are you worth? This is the characteristic attitude of common sense.

We are now in a position to see the difference between the facts of science and the values of common sense. When science takes its attitude toward the whole of experience, facts result. When, on the other hand, common sense takes its attitude toward the same experience, appreciations, interpretations, values result. The former are a function in part of what is given in experience, and in part of the attitude of the observer. As descriptions they refer to the given, or the perceptual; they may be demonstrated in the sense that the aspect of experience to which they refer may be had by any normal individual who has the necessary training in observation; and they have no ulterior meaning, *i. e.*, they do not refer beyond the given to common-sense objects or to any other value. Values, on the other hand, are a function of the knowing individual, and are possessed by the individual. Statements of value are not descriptions but explica-

tions which refer, not to the given, but to appreciations or interpretations put upon the given.

There is, then, a vast difference between the declarations of common sense and the facts of science. The confusion of the two by the older writers about science was, however, natural enough. The attitude of common sense is the habitual attitude of everyday life, and the man of science in putting off the old and putting on the new does not realize the right-about-face in attitude; he seems still to be dealing with the same world that he has always known, and at first the only differences he can see between the old and the new knowledge are those in accuracy of statement and systematic organization. It is not until he actually compares the two sets of results that he begins to see the more fundamental difference. Then he finds, for example, no good drinking water or pumps, no locomotive whistles or red flags, no beautiful shade trees or gorgeous peacocks in science; he finds instead a synthesis of hydrogen and oxygen, a set of mechanical principles, auditory qualities or frequencies of vibration, visual quality or radiant energy, and living organisms that possess biological resemblances to and differences from thousands of other organisms; nowhere in science does he find any hint of utility, of beauty, or of worth. The confusion of the older writers about science resulted, therefore, from the failure to recognize the subtle shift in attitude which is characteristic of scientific observation.

8. The method of critical science. It is now said, also, that the characteristic method of science is not induction but observation. It is true, however, that both *before* and *after* an observation science also employs logic. *Before*, because the observation is usually made by way of experiment, *i. e.*, the conditions of observation must be known and brought under control; the determination of these conditions and the plan for controlling them must, of course, be thought out in advance of the observation. *After*, because science is much more than a mere collection of observations. When facts enough have been obtained they must be ordered, and subsumed under general laws. This is accomplished by the logical methods of analysis, synthesis, induction, and deduction. The logic of a scientific generalization must be sound, of course, but proof of a law or theory is made, in science, by appeal not merely to the correctness of its logic but to observation. It is, therefore, the peculiar attitude of observation, the purely descriptive nature of the facts obtained by observation, and the test by observation of its laws, theories and hypotheses, that constitute the essential character of science and differentiate it from all other kinds of knowledge.

9. The problem of critical science. The problem of science, it is maintained, is simply to describe the world as science sees it. Science cannot explain events

by assigning causes. It can only do the one, and cannot do the other, by virtue of its self-imposed limitations. It is restricted to description because it begins with observed fact, and because it regards no logical conclusion about observed facts as valid unless it can be verified by observation. The term "to describe" must therefore be taken literally to mean *to write down* in words or other symbols, what is observed from the scientific point of view. A fact is a single description; a law is a general, though often simplified, description that includes a large number and variety of facts; a theory or hypothesis is a tentative description which looks to future observation for verification. Again, science cannot assign causes, because causes cannot be observed. It can, of course, observe sequences or concomitances of events, but to say that some one event is cause and another is effect, however useful in practical life it may be, is nevertheless unscientific. The only way, therefore, whereby science may explain a fact is to bring it into relation with other familiar facts, *i. e.*, to find a law under which it can be subsumed. Thus, the falling of an apple is explained by the law of gravitation; but this law says no more than that two bodies are attracted to each other in a manner directly proportional to the product of their masses and inversely proportional to the distance between their centers of gravity. This law, then, like all laws in physics, is merely a generalized description of what happens. It follows that

such explanatory concepts as mechanism, vitalism, and the like, have no place in science. "The universe," as Cooley writes, "is not controlled by any kind of *description*. As well might the painter of a battle scene claim to be the victorious general in command." [12] Doctrines like these must be regarded as philosophical interpretations put upon scientific laws. Furthermore, because science cannot explain in the sense of a productive agency, the prediction of future events can have little meaning in critical science. Since the law upon which a prediction is based is derived by induction from observed facts, the fulfillment of a prophecy does no more than test the correctness of the observations, and the soundness of the induction. On the side of method it often happens, however, that an investigator argues by deduction from an hypothesis that under certain conditions certain facts will be observed. If the observation should, in fact, be made, and the prediction prove true, the hypothesis is, in so far, verified.

10. The goal of critical science. The goal of science, from the critical point of view, is the acquisition of knowledge for its own sake, and not for the practical use of mankind. This would seem to follow by necessity from the purely descriptive or existential nature of its facts, and also from its inability to explain them by assigning their causes. Those who

[12] W. F. Cooley, *The Principles of Science*, 1912, 163.

evoke the history of science in support of this view would freely admit that the course of science has been paralleled by practical results in the forms of mechanical inventions, health conservation, and an orderly Nature instead of a fearsome Unknown, all of which goes far beyond the dreams of those who contended that these results were themselves the legitimate goal of science. They would also concede that indirectly science has gained immeasurably from the practical arts by way of instruments for observation, and of problems for scientific solution. They would further agree that men of science have themselves often turned from the pursuit of purely scientific to practical problems. Nevertheless, despite all these concessions, they would still maintain that the impersonal attitude of science, and the limitations which the search for accurate knowledge lays upon science, would still require a single-hearted devotion to knowledge for its own sake. The question of the relation of scientific knowledge to practical ends is, however, an important one which we must later consider.

11. Critical classification of the sciences. Finally, since the world of science is the whole world regarded from a particular point of view, or, what amounts to the same thing, since any object in the world may serve as an object of observation for any one of the sciences, the facts of the various sciences are descriptions of different *aspects* of the whole world of science.

This means that every one of the different sciences must, in addition to the assumption of the attitude of all science, take an attitude peculiar to itself. It would, of course, be absurd to suppose that a man of science first consciously abstracts from all other aspects than his own. What actually happens is that he observes the world from his own point of view, which, because he is a man of science, includes or presupposes the attitude of all science. The characterization of the special attitudes of the various sciences cannot be, or at least in the history of science has not been, made *a priori*. They must, on the contrary, be made *a posteriori*, and indeed successful characterizations have at the present time hardly been reached. The classification of the various sciences will, therefore, ultimately be based either upon the particular point of view of each science, or else upon the nature of the facts which result from observation from these points of view.

12. Summary. We may summarize and contrast the two conceptions of science as follows: The traditional conception starts with a world consisting of different kinds of objects and occurrences which have already been distinguished by common sense. Every one of the special sciences selects certain of these objects or events for its particular study and proceeds to classify them, and to discover their laws. Its distinctive method is the logical method of induction;

its problem is to explain its subject matter, and to predict future occurrences in nature; and its goal is to bring the world under control for the use of mankind.

The critical conception of science, on the other hand, begins with the whole world of experience, and observes it from a particular point of view. Within this attitude there are special points of view which result in the description of various aspects of the world of experience, and thus furnish the particular subject matters of the sciences. Its characteristic method is observation, and its facts are the results of observation. Both before and after its facts are obtained, however, it employs also the methods of logic. Its problem is to describe the world; it cannot, in the popular sense of the word, explain it, and prediction of future events is not one of its objects. Its goal is the acquisition of knowledge for its own sake and not for practical use.

Supplementary Readings for Chapter I

Paragraph

2–4. For essays written from the traditional conception of science, see H. Spencer, "The Genesis of Science," in *Essays*, ii, 1891, 1 ff.; J. A. Froude, "The Science of History," in *Short Studies on Great Subjects*, First Series, i, 1901, 1 ff.

For a brief statement of Bacon's views, see F. Bacon, *Advancement of Learning*, Bohn's Philosophical Library, 1893, v, Chap. 3, 187–197; *Novum Organum*, Lib. ii, Aphorisms 10–20.

For the influence of Bacon on subsequent scientific thought, see W. Whewell, *Philosophy of Discovery*, 1860, Chaps. xv, xvi; T. Fowler, ed. Bacon's *Novum Organum*, 1878, Introduction, sec. 14, especially pp. 124–128; J. F. W. Herschel, *Discourse on the Study of Natural Philosophy*, 1831, 54, 78, 136; J. T. Merz, *History of European Thought in the Nineteenth Century*, iii, 1912, 374–385.

5. J. F. W. Herschel, *op. cit.*, 107 ff.; W. Whewell, *History of Scientific Ideas*, i, 1858, 173 ff.; J. S. Mill, *Logic*, iii, 1856, v, sec. 5; W. S. Jevons, *Principles of Science*, 1892, Chap. XI; J. Fiske, *Outlines of Cosmic Philosophy*, i, 1874, 146 ff. For a brief account of mechanism, see W. F. Cooley, *The Principles of Science*, 1912, 135 ff. For mechanism versus vitalism in Biology, see J. A. Thomson, *Introduction to Science*, 1911, 143 ff. For the classical statement of vitalism, see H. Driesch, *Science and Philosophy of the Organism*, 1908.

6. O. Lodge, *Pioneers of Science*, 1893, 93; A. Comte, *The Positive Philosophy*, Bohn's Library, i, 1896, Bk. ii, 149 f.; H. von Helmholtz, "On the Relation of Natural Science to General Science," in *Popular Lectures on Scientific Subjects*, i, 1904, 25.

7. J. A. Thomson, *Introduction to Science*, 1911, Chaps. i–iii; A. Hill, *An Introduction to Science*, 1900, pp. 1–11; W. K. Clifford, *Lectures and Essays*, i, 1879, 104, 110, 126; W. F. Cooley, *The Principles of Science*, 1912, 47, 219 ff.; N. Campbell, *What is Science?* 1921, Chap. ii; J. Royce, *Spirit of Modern Philosophy*, 1892, 390 ff., 481; *The World and the Individual*, ii, 1901, 26; K. Pearson, *Grammar of Science*, 1911, 60 ff.; A. N. Whitehead, *Concept of Nature*, 1920, 28–32; E. B. Titchener, *A Beginner's Psychology*, 1917, 1 ff., 37; "Psychology: Science or Technology?" in *Pop. Sci. Mo.*, lxxxiv, 1914, 42–46; A. D. Ritchie, *Scientific Method*, 1923, Chap. ii, 23 ff.; W. C. D. Whetham, *The*

Recent Development of Physical Science, 1904, 14, 16, 34; J. A. Thomson, *Science and Religion*, 1925, 127.

8–10. J. A. Thomson, *Introduction to Science*, 1911, 35 ff.; E. Mach, *The Science of Mechanics*, transl. by T. J. McCormack, 1919, 5 f.; G. R. Kirchoff, *Vorlesungen ueber mathematische Physik*, i, Mechanik, 1883, Vorrede, iii, 1; W. Ostwald, *Natural Philosophy*, transl. by T. Seltzer, 1910, i, secs. 2, 3, 9, 12, 13; J. T. Merz, *op. cit.*, iii, 1912, 402 ff., 574 ff.; iv, 1914, 778 ff.; J. Ward, *Materialism and Agnosticism*, 1899 and 1903, 1, 81 ff.

For logical aspects of method and theories, see A. D. Ritchie, *op. cit.*, 52 ff., 83 ff., 155 ff. As regards explanation in science, see K. Pearson, *op. cit.*, 113–142; B. Russell, "On the Notion of Cause," in *Mysticism and Logic*, 1918, 180 ff.; A. Comte, *The Positive Philosophy*, Bohn's Library, 1896, 1, 5 f.; W. C. D. Whetham, *op. cit.*, 28 ff.; A. D. Ritchie, *op. cit.*, 97; W. K. Clifford, *op. cit.*, i, 146 ff.; J. Ward, *op. cit.*, i, 4, 61 ff.; ii, 240 ff.

11. J. A. Thomson, *op. cit.*, 54 f., 116 f., 130; A. Hill, *op. cit.*, 44; E. Mach, *Analysis of the Sensations*, transl. by C. M. Williams and S. Waterlow, 1914, 17; E. B. Titchener, "Psychology: Science or Technology?" in *Pop. Sci. Mo.*, *loc. cit.*, 41; W. C. D. Whetham, *op. cit.*, 16.

CHAPTER II

GENERAL PSYCHOLOGY

Our business here is not to know all things, but those which concern our conduct. If we can find out those measures whereby a rational creature, put in that state in which man is in this world, may and ought to govern his opinions, and actions depending thereon, we need not be troubled that some other things escape our knowledge. This was that which gave me the first rise to this Essay *concerning the* understanding. *For I thought that the first step—was to take a survey of our own understandings, examine our own powers, and see to what things they were adapted.*—JOHN LOCKE.

13. General psychology. Any treatise on psychology which has as its title or subtitle some such term as Primer, Introduction, Essentials, Outline, Fundamentals, Textbook, or Principles of Psychology (without further predication), belongs to General Psychology. It is called "general" because it deals with the fundamental conceptions, together with certain facts of the science arranged in systematic fashion. As a rule the facts are those of the normal, human, adult individual when regarded from the psychological point of view; and these facts taken together serve as a standard of reference for the study of similar facts in the special psychologies, such as abnormal, animal, child, and social psychology. We turn to the works on

General Psychology, therefore, to discover, if we can, what psychology as science is.

14. Pre-scientific psychology. Before psychology became a science it was a branch of philosophy. Its subject matter was mind, or soul, which was defined as a being that had faculties or powers such as, *e. g.*, those of sensing, perceiving, thinking, remembering, desiring, and willing. The study of this "mind" revolved about two sets of problems; the one, the nature of mind itself—whether it was spiritual or material, unitary or divisible, bound to or free from the body; the other, the nature of the activities of this mind. The method of the former was purely speculative and hence was called *rational psychology;* that of the latter was the logical analysis of *experience* and so was called *empirical psychology.*

Experience was, however, regarded as of different kinds. Things like stars, stones, and trees, for example, seemed unlike such other things as thoughts, memories, and feelings. The first sort was observed by means of the senses and therefore was called external experience; the second kind was perceived by reflection, or internal observation, and consequently was named internal experience. The natural sciences dealt with external experience; and since psychology was concerned with internal experience, had its own method of observation, and could employ the logical methods of natural science, there seemed to be no reason why it

should not itself take a place among the natural sciences.

Psychology, however, has had great difficulty in limiting its subject matter to internal experience, for, in the first place, it did not include sensory experience like red, bitter, warmth, which had been classed as outer experience but seemed nevertheless to be mental. Red, for example, is out in space and varies in size; yet, if stared at without eye-movement it changes first to yellow or blue, and then to gray; or if sufficiently reduced in size it also changes to gray; or, again, if the intensity of illumination is lowered it once more changes first to a darker red and finally to a dark gray. Red is observable like any physical object, but has laws of its own which are unlike physical laws. The external-internal criterion seems, therefore, to fail; and psychology must either relinquish sensory experience to physics or physiology, or else find some other criterion for including it in its subject matter. In the second place, it has not been easy to distinguish psychology from biology. The latter, a part of outer experience, was separated from physics as the living from the not-living; biology deals with organic, and physics with inorganic, phenomena. Since internal experience is not known apart from the organism, it may be regarded as living phenomena, and psychology would then become a branch of biology. Some philosophers, called materialists, have indeed gone so far as to deny outright all internal experience,

together with internal observation; and they have proposed to explain solely in terms of the body, all the phenomena that were ascribed to the soul. These difficulties have, in one form or another, required the consideration of every empirical psychologist who has formulated a definition of his subject matter. We shall not at present pursue them further, but shall, instead, turn to present-day treatises and see what psychology from the empirical point of view has turned out to be.

15. Empirical definitions of psychology. The current definitions of the subject matter of empirical psychology may conveniently be classified into four groups. The first regards mental phenomena as the phenomena of consciousness, and these may or may not, according to the author of the definition, be considered as independent of the behavior of the organism. Systems of psychology thus defined we shall hereafter call *the consciousness psychologies*. The second group rejects all subjective experience and defines its subject matter as the behavior of the biological organism regarded as a whole. These we shall call *the behavior psychologies*. The third group refuses to limit itself solely either to the phenomena of consciousness or to the behavior of the organism, and defines the subject matter of psychology as the reactions, or the responses, of the human or animal individual to its environment. This individual reacts

in two ways—as consciousness and as behavior. We may, therefore, distinguish this group as *the dual-reaction psychologies.* The fourth group defines psychology in terms of what we have heretofore called sensory experience or content, and also of certain kinds of activities which are characterized as 'performances' or functions of a total "mind-body" individual. We may designate it *the mind-body performance psychology.* We shall have to consider these four groups of empirical psychology in more detail, and we shall take them in order.

16. Empirical psychology as consciousness. It is a common characteristic of the first group that the definition in terms of internal experience has disappeared, and that in its place we find a definition in terms of a knowing subject that has experience of a world of objects. The subject is variously called an 'I', a 'mind', or a 'self'; the experience is a consciousness which has various modes, *i. e.*, knowing, feeling, or doing, and the object is anything that is immediately known, or felt, or striven for. Let us suppose, by way of illustration, that as I hear a noise I say, "I hear a bird." I, in this case, am the knowing subject; if I were not a knowing creature I should not either have the consciousness of hearing or be conscious of what I hear. The 'hearing' is the specific way in which I am at the moment conscious; I might of course have been conscious in other

ways—I might have seen a bird, or enjoyed a bird, or desired a bird—but my consciousness is none of these, it is a *hearing*. The object in this illustration is either the noise, or the bird, or both the noise and the bird. Empirical psychologists are not agreed on this point; most of them would say, however, that the immediate object is the noise but that the noise is a sign which signifies or means bird, or, as it is sometimes expressed, the noise brings me knowledge of a bird. The noise is the immediate object because it arises through stimulation of a sense organ and the excitation of the brain. In American and German empirical psychology it is often called the *content* of the activity or "act" of hearing; in English psychology it is sometimes called a "presentation." "Contents" of this kind, or "presentations" are, along with the "acts," the subject matter of psychology.

It will be observed that although the reference to outer and inner experience has been given up, the two kinds of experience, the activities and sensory experience, still remain; but are now together characterized as phenomena of consciousness, the one as mode of being conscious, the other as content of consciousness. Psychology thus becomes the science of the phenomena of consciousness. What then, we may ask, is *mind?* Mind is either the sum-total of all the states of consciousness, or else it is the subject that has the consciousness; empirical psychologists are again not

agreed. From the former point of view psychology may be regarded as the science of mind; from the latter, empirical psychology can know nothing of mind except its consciousness, and psychology becomes the science of mind's experience.

So far, most empirical psychologists of this first group would accept this summary statement of their definitions; but if we should attempt to go further into detail we should find all sorts of disagreements. These, however, need not be discussed in this book. The essential point is that mind, whether it is a being that is conscious, or whether it is consciousness itself, is fundamentally conceived as serviceable, useful, as an agent that exerts itself and produces results for the individual, the 'I', or the 'self' that has it. When, in popular language, we speak of minds as good or bad, as keen or dull, as alert or sluggish, we employ the term 'mind' in its strictly empirical sense. The principal service of mind as thus conceived is to furnish us with knowledge and thereby to direct our activities; and although *knowing* is only one of the three empirical modes of being conscious, for we also feel and will, it is the dominant one. Furthermore, as we have seen, sensory experience, *i. e.*, sensations and images, serve consciousness as signs of external objects; they point to or indicate objects beyond themselves. Mind must, of course, by means of its knowing activity, learn to interpret these signs, must find out by experience what they signify; but this is to

say that sensory experiences are in themselves meaningful or significant. They are already bits of knowledge; for in no other way could they be signs.

Although the principal service of the empirical mind is to furnish the 'I' or 'self' with knowledge, it also feels and wills. Let us again suppose, for example, that when I hear the bird I am also annoyed and I decide to drive it away. I might, of course, have felt pleased, or I might also have felt neither pleasure nor displeasure. Whatever the feeling may be it is generally regarded as different from the "act" or consciousness of 'hearing'; it is, as it were, something which the hearing stirs up in me. Feeling, therefore, is usually classified as an act or function which, although in a way dependent upon knowing, is nevertheless of a different class or category. Furthermore, the decision to drive the bird away seems, like all determinations or resolutions, quite unlike both the hearing and the feeling; I might have both of these without this particular decision, or indeed without any decision at all. Moreover, there seems to be a logical difference between knowing and feeling on the one side, and deciding or (as it is usually called) willing on the other; to know is one thing, to feel is another, and to resolve is yet a third thing. The two latter, however, and particularly willing, seem to be in closer relation to bodily conduct than does knowing; feeling, it is said, has a reference to our bodily state, and willing bears a forward reference to some bodily

activity. This raises the question of the psychological relationship of consciousness to bodily conduct.

The human organism, as we know, is in constant movement. Its heart beats and it respires regularly throughout its life, its intestinal tract rhythmically contracts and relaxes, its blood vessels in the skin contract or dilate. Furthermore, the organism moves its head, its eyes, jaws, tongue, and throat muscles; its arms, hands, and fingers; its trunk and legs. These movements have various generic names, such as actions, motor activities, responses, reactions, and in sum, behavior. Some of these are said to be voluntary, others to be automatic or reflex, according as the "I" that has them can or cannot control them. It is one of the problems of empirical psychology to determine its attitude toward this behavior. Some of those writers who define psychology as phenomena of consciousness, regard behavior as extra-psychological. Even in the case of a voluntary decision which looks forward, so to speak, to an action by the individual, the decision is no less a mental phenomenon because, as may happen, the muscles refuse to act. Behavior may, it is true, at times furnish evidence of mental activity, and then it is taken into account; otherwise it has no place in psychology.

There are other writers, however, who regard mind as one of the functions of the biological organism. The phenomena of consciousness have a definite relation to the movements of the individual. From this

point of view psychology is considered as a branch of biology. The term "function" came into empirical psychology from physiology. Just as digestion and circulation were called functions in physiology, so in psychology mental phenomena are said to be functions of the organism. Mind itself is still defined as "consciousness"; but as function, it knows the individual's environment, feels the state of its own body, and, especially when the automatic actions of this body are inadequate to a particular situation, steps in as guide and control. To revert to our former illustration, it is the function of mind to hear the sound, to interpret it as bird, to find the bird agreeable or disagreeable, to decide, in case "I" am in doubt, whether I shall continue to listen, or drive the bird away, or go about my business. The fundamental difference between these first two groups of definitions is that those of the first group stop with the processes of knowing, feeling, and deciding; whereas those of the second group regard "all mental operations" as having their ultimate significance and final outcome in motor activities.

The consciousness psychologies recognize two kinds of observation. The one is called introspection or "inner" observation, the other is "outer" or external observation. The former, as its derivation indicates, means "looking inward"; it is "observation by an individual of his own conscious actions;" it is to "attend to the workings of one's own mind." External observation, on the other hand, means

"immediate objective observation of other individuals." "In objective observation, the observer watches something else, and not himself." Since the consciousness psychologies regard the two kinds of experience, the activities and the sense impressions, as together constituting the phenomena of consciousness, and since they also stress the private ownership of these phenomena by the "I", "self", or "mind" that has them, it follows that introspection is for them the only direct method of observation. External observation is, however, recognized by them as an *indirect* method. "I", for example, may by observing the behavior of other individuals infer that they have experiences like my own.

17. Empirical psychology as behavior. The second type of definition, which characterizes the subject matter of psychology solely in terms of the nervous, glandular, and muscular actions of the biological individual, is at once a reaction against and a negation of the notion of consciousness whether as act or as content. This denial of consciousness and this attempt to find only in the body those things which "concern our conduct" is reminiscent of the materialistic conception of the soul to which we have referred above (see p. 25 f.). The soul was renounced by the materialistic philosophers because all the phenomena usually explained by it could, they thought, be better explained by reference to the motions of the body.

Contemporary behaviorists likewise abandon mind because they claim, as Weiss expresses it, to " render a *more* complete and a *more* scientific account of human achievement *without* the conception of consciousness than traditional psychology is able to render *with* it. The factors which traditional psychology vaguely classifies as conscious or mental elements merely *vanish* without a remainder into the biological and social components of the behavioristic analysis." [1] They also declare, as indeed Comte had declared a century before, that " psychology has failed signally . . . to make its place in the world as an undisputed natural science," [2] and that the reason for its failure was largely its limitation of subject matter and choice of method.

For the behaviorist, then, " psychology is that division of natural science which takes human activity and conduct "—the doings and sayings, both learned and unlearned—of people as its subject matter.[3] The "sayings ", if spoken, are not meaningful sounds but merely throat movements or, if written, they are again not meaningful words but manual movements of the man who writes them, or visual stimuli for the man who

[1] A. P. Weiss, *A Theoretical Basis of Human Behavior*, 1925, Preface, vii.

[2] J. B. Watson, *Behavior: An Introduction to Comparative Psychology*, 1914, 6; A. Comte, *Cours de philosophie positive*, i, 1830, 37; ii, 1838, 774 ff.

[3] J. B. Watson, *Psychology from the Standpoint of a Behaviorist*, 1919, 1; *Behaviorism*, 1924, 6, 11, 15.

"reads" them. Similarly, all the old and familiar categories of psychology either disappear or are transformed; sensation becomes movement responses to simple stimuli; perceptions are movement responses to complex stimuli or situations; memory is habit; emotions are movement and glandular responses to situations; and so on. Behavioristic psychology would, consequently, seem to be closely allied to biology, and it has in fact had some difficulty in finding a special field for itself among the biological studies. It regards physiology as its nearest neighbor, but it differs from physiology in that it deals with the organism regarded as a whole, and with the responses of this organism to "total situations in the daily life of the individual," [4] whereas physiology studies the behavior of special organs, the heart, liver, lungs, circulation, respiration, general metabolism, and the like. Thus, from this point of view psychology is no longer the science of mind in any of the older senses; mind for it is non-existent.

18. Empirical psychology as dual reaction. The third attempt to define empirical psychology takes what may roughly be called middle ground between the consciousness psychologies on the one hand, and the behavior psychologies on the other. Psychology now deals both with mental phenomena and with certain kinds of behavior. Those psychologists who

[4] J. B. Watson, *op. cit.*, 20.

hold this view derive their subject matter from a human or animal organism which, when stimulated by its environment, responds in two ways: by conscious experience and by behavior. Both kinds of responses are considered as psychological. Not all of the behavior of the organism is, however, considered as subject matter of psychology. " A man's (or an animal's) behavior," writes Warren, " includes the various ways in which he acts upon the environment as a result of the environment acting upon him. But the word ' act ' is used here in a very specific way. If a violent gust of wind strikes a man suddenly and blows him down, his movement in falling is not behavior, nor is the dent he makes in the ground a response—he is not acting upon the environment in an *organic manner*. But if he is able to brace himself against the wind and avoids falling, or if he puts out his hand to break the fall, these movements are instances of behavior; the external force in such cases affects him not merely physically but also organically—he responds as an organism to the stimulation. It is this activity that goes under the name of behavior." [5]

" Conscious phenomena," on the other hand, " are the effects of the environment upon the creature as they appear to the creature himself." " To call a sensation a form of reaction," Woodworth says, " means, then, that the sensation is not something done to the person, nor passively perceived by him

[5] H. C. Warren, *Human Psychology*, 1919, 11.

from outside, but something that he himself does when aroused to this particular form of activity. What comes from outside and is received by the individual is the stimulus, and the sensation is what he does in response to the stimulus." [6] Sensation, therefore, is a kind of activity, and all the other mental activities, such as knowing, remembering, imagining, feeling, and willing, are also reactions to stimuli.

The authors who thus define psychology in terms of a twofold response or reaction to stimuli employ 'introspection' as the direct method for the study of conscious responses, and as indirect for the nervous functions. They also rely upon external observation as direct method for motor responses, and as indirect for conscious reactions.

19. Empirical psychology as mind-body performance. The fourth type of definition is in terms of a total organism, and it distinguishes three kinds of subject matter which are conditioned upon the total organism. (*a*) A kind of experience which we have characterized above as sensory experience, such as red, warmth, pain, tickle, sweet. It is observable and may be described in qualitative and quantitative terms just as any other 'external' experience, and it constitutes the one part of the subject matter of psychology. (*b*) The neural, glandular, and muscular behavior of the organism, which as such is subject

[6] R. S. Woodworth, *Psychology*, 1921, 46.

matter of biology, but is in part intimately related to psychology. (*c*) Certain kinds of activity, like perceiving, remembering, thinking, which are not observable in the strict sense, but about which it is possible to obtain much information. These are called 'functions'; they are, however, functions neither of a purely psychological nor of a purely biological individual, but of a total mind-body individual. "When", as Bentley illustrates, "we purchase a ferry ticket or select our fruit at breakfast we obviously employ our bodily members; but the purchase, the selection and a thousand and one other acts just as obviously include mental factors which intimately coöperate in performance with the body. So we do not think, imagine, remember, and approve with disembodied minds or with senseless bodies; but always with the conjoint agency of both."[7] Thinking, then, is at once a mental and a bodily (a "psychosomatic") function; more particularly, it is in part a function of the sensory experience described above under (*a*), and in part a function of certain kinds of the behavior stated under (*b*). The particular contribution of sensory experience is to furnish meaning, and to supply a gauge of the state of our own bodies. The special agency of the bodily activities is to furnish the vehicle or the machinery for and the energy of the function. In this way one avoids the necessity of postulating a form of energy

[7] M. Bentley, *The Field of Psychology*, 1924, 189.

and a mechanism peculiar to mind. The only energy the functions have is derived from the body and is, therefore, physical. It will be noticed also that under this view the distinction between the two kinds of subject matter, sensory experience and the functions, is clearly drawn; they are regarded as intrinsically different and can be studied only by different methods. For, although sensory experience may be directly observed or 'inspected' just as physical or biological phenomena may be observed, the functions are non-observable. The mind-body individual is, however, able to furnish information about the functions by the method of 'comment', *i. e.*, it is able to give an account of what it is trying to do, and what it is doing.

20. The subject matter of empirical psychology. Our survey of psychology at large is not yet complete, for we have still, in the next chapter, to investigate a type of psychology which has broken away from the trend which we have been studying and which we have called empirical. We have thus far found a vast difference of opinion as regards both the subject matter and the method of empirical psychology. Beneath these differences, however, there is a common attitude toward the whole of experience, which marks all these systems as empirical. We have now to see exactly what that attitude is, and then to consider in what sense empirical psychology is to be regarded as science.

Although empirical psychology had its beginnings with Aristotle, and was further developed in the scholastic philosophy, John Locke—a contemporary of Newton, an early member of the Royal Society, and a contributor to the natural philosophy of his day—is generally regarded as its founder. In an attack upon the problems of knowledge, Locke, in the true Baconian spirit, turned his back upon speculation and faced *experience*. He it was who first distinguished the two kinds of empirical knowledge, and proposed the two methods which eventually became 'inner' and 'outer' observation. As the quotation at the beginning of this chapter shows, Locke set out to inquire into "those things which concern our conduct, . . . those measures whereby a rational creature . . . may and ought to govern his opinions and actions depending thereon." From his time until our own the attitude of empirical psychology has on the whole remained the same; the direction of the inquiry is still toward those things which "concern our conduct." It is true that Locke was primarily interested in what he later called the 'Conduct of the Understanding'; for the philosophy of his time was primarily interested in the origin and validity of knowledge; actions were considered as 'depending' upon this knowledge. Philosophers drew a clear line of demarcation between the conduct of man and that of animals; that of the former was supposed to be guided by reason, that of the latter by instinct. The

individual with which Locke dealt was therefore a 'rational creature,' and it is only natural that Locke and his followers should, for many years, have sought the basis of conduct in "our own understandings", "our own powers", and to "see to what things they were adapted." Subsequently, mental came to be all but divorced from bodily conduct, and some psychologists, as we have seen, have considered mind as independent of the behavior of the individual. There has, however, been an ever-increasing pressure, both without and within empirical psychology, for the broader point of view. It was human and animal conduct in the sense of bodily activities that interested the materialistic philosophers; Darwin's theory tended to lower reason from its exalted position, and to close the gap between man and animals; an animal psychology based upon behavior was rapidly growing; and, most important of all, the demands upon psychological theory for the practical problems of life have in the twentieth century become increasingly insistent. We need not be surprised, therefore, to find contemporary psychologists agreeing as to subject matter and yet disagreeing as regards the content of their theories. McDougall, for instance, states that psychology is "the science which attempts to describe and explain the conduct of men and of other living creatures,"[8] and then writes a psychology based upon mental activities. Again Watson declares that "psy-

[8] Wm. McDougall, *Physiological Psychology*, 1913, 1.

chology is that division of natural science which takes human activity and conduct as its subject matter," [9] and then furnishes a theory solely in terms of external behavior. And Woodworth says that the psychologist would know and understand human "activities",[10] and then works out a theory in terms of responses-to-stimulus that are both mental and physical. Empirical psychology is, therefore, a theory of conduct; at times the conduct of the mind or of the 'I', at others of the biological organism, at still others of the mind-body, but always a theory of conduct.

21. Empirical psychology as science. In what sense, then, is empirical psychology a science? It is easy to see that it is not science in the critical sense. Empirical psychology is not concerned with conduct for its own sake. In that case it would make no difference whether conduct were rational or irrational, voluntary or involuntary, instinctive or habitual, a response to stimulus or a function. It would be only motion, a succession of observed occurrences in space and in time. In that case, also, there would be no mental activities, for they are interpretations of what we or other individuals than ourselves seem to be doing; they are not in the strict sense observable. May we say, then, that empirical psychology is science in the traditional meaning of the term? In our study of the traditional conception of science we found that it

[9] J. B. Watson, *op. cit.*, 1. [10] R. S. Woodworth, *op. cit.*, 6 ff.

recognized no inherent difference between its facts and those of common sense, that it identified its method of observation with that of common sense, that for it an essential problem was to explain its subject matter, and that its ultimate goal was a practical object. Let us see in how far these are characteristics of empirical psychology.

22. The nature of the facts of empirical psychology. Empirical psychology, also, does not distinguish between scientific facts and those of everyday life. Stout, for example, says, " Scientific knowledge is a development of common-sense knowledge, distinguished by a more purely theoretical interest and by its systematic thoroughness and precision." [11] By this he means that the presuppositions and the data of the common-sense mind are the same as those of the scientific mind. In the consciousness psychologies this is obvious enough; it is as common-sensible to think of mind as active, as it is to think of the sun as rising in the east. It is natural, again, to regard sensory experience as fused with the meaning of objects—to regard the green as grass, the blue as sky, the cold as ice, and the sweet as sugar. The behaviorists are no less common-sensible. Watson, indeed, declares that common-sense psychology is genuine but crude; it does not, and never can, go far enough. This is the essential difference. In the reaction and per-

[11] G. F. Stout, *A Manual of Psychology*, 1913, 32.

formance psychologies, the individual that responds and performs is the familiar one who lives and moves in a world of things and situations; he hears, tastes, smells, and handles them; he learns to know them, to enjoy or dislike them; he seeks and avoids, appreciates and repels them.

23. The method of empirical psychology. Empirical psychology does not, either, distinguish scientific and ordinary (usual) observation. It recognizes, of course, a difference in technique; scientific observation is controlled by experimentation, and ordinary observation is not; but observation is, in itself, the same as that in everyday life. That this is true of external observation is explicitly stated by Watson, who says, "Observation, as the man on the street uses the term is, of course, the oldest method known to science;" the phrase "method of observation" is employed by him in the sense of experimental procedures. That internal observation is no less common-sensible is implicit in the definition of introspection. The "workings of one's own mind" are not, in any strict sense, directly observable; they are meanings or interpretations. That mental activities and meanings cannot be observed is recognized by several authors, who nevertheless include them in psychology on the ground that they are "lived" or experienced; and, as we have seen, Bentley proposes a special method for the study of his 'functions'.

24. The problem of empirical psychology. The explanation of its subject matter is for empirical psychology, as it is for traditional science, an essential problem. Although a reading of any one of the text-books of empirical psychology leaves the impression that the fundamental aim of the author is to show how mind, body, or mind-body works in order that we may understand why its phenomena occur as they do, the explicit statement is rarely made. It is sometimes said that the problem of psychology is to describe and explain its subject matter. The general procedure of the exposition is, however, to present a classification of psychological phenomena, giving instances and characterizations of the various kinds, and then to explain them as "due to," or "depending upon," or "caused by" something else. The "descriptions" are explications or statements of meaning rather than descriptions in the strict sense. The explanations regarded as causes have given empirical psychology a great deal of trouble. No one cause or principle has been found that will explain all the facts. The consciousness psychologies have, consequently, two sets of causes—the one purely mental, the other physiological. The conscious activities are regarded as teleological, in the sense that they are always directed toward an end; and mental dispositions, or unconscious processes, are assumed which are known only by their results. The physiological causes include those functions of the nervous system which condition

sensory experience and, in the opinion of some authors, the course and interconnection of ideas. The acceptance of these two causal principles involves also the metaphysical problem of the relation of body and mind; most psychologists of this group accept, provisionally at least, the interaction hypothesis—that at times mind is influenced by the body, and at others body is influenced by the mind. Those psychologies whose subject matter is stimulus and response explain in terms of the stimulus or situation (environment), and of the operation of the nervous system (innate and acquired tendencies such as reflexes, instincts, habits, physiological states of the organism, and so forth). From this brief characterization it is apparent that the consciousness psychologies have taken the logical aspects of explanation much more seriously than have the others; but for all alike the problem of explanation is an important one.

25. The goal of empirical psychology. At the beginning of this discussion we found that empirical psychology was not science in the critical sense, that it did not study the conduct of the individual for its own sake. We have now positively rather than negatively to determine its aim or goal. Conduct, in empirical psychology, involves some end; it is something more than the activity of a purely mechanical instrument; it is the conduct of an individual that comes into the world as a highly organ-

ized unit, and that lives a life in an extraordinarily complex environment. In its organization the individual is adequate to a conduct no less complex, some of which is fully established at birth, some perfected, and some acquired during the life of the individual. Empirical psychology seeks to analyze this conduct, to know its kinds, its variations, its developmental history, its causes; and it seeks also to furnish a theory of conduct so that it may in the end be brought under control, reduced to rule, and predicted. This is the aim that is characteristic of traditional science. In this respect, therefore, as well as in the nature of its subject matter, its methods and its problems, empirical psychology bears the marks of traditional science. Whether or not it is possible for psychology to be a science in the critical sense of the term, we shall consider in the next chapter.

Supplementary Readings for Chapter II.

Paragraph

14. G. Villa, *Contemporary Psychology*, 1903, 63 ff., 265 f.; O. Külpe, *Introduction to Philosophy*, transl. by W. B. Pillsbury and E. B. Titchener, 1901, 55–58; O. Klemm, *A History of Psychology*, transl. by E. C. Wilm and R. Pintner, 1914, 159 ff.; J. Locke, *Essay Concerning the Human Understanding*, i, Chap. I; J. O. de la Mettrie, *L'Homme Machine* (1748), transl. by G. C. Bussey, 1912.

15–16. G. T. Ladd, *Psychology, Descriptive and Explanatory*, 1894, 1–6; G. F. Stout, *Manual of Psychology*, 1913, 1–18, 26, 62, 720 f.; S. Witasek, *Grundlinien der Psychologie*, 1908, 1–8, 71–76; W. B. Pillsbury, *The Funda-*

mentals of Psychology, 1922, 1–8; M. W. Calkins, *A First Book in Psychology*, 1912, 1 ff., 273 ff.; G. Dumas, *Traité de psychologie*, i, 1923, 5 ff.; R. M. Ogden, *An Introduction to Psychology*, 1921, 3 ff., 10 f.; K. Dunlap, *Elements of Scientific Psychology*, 1922, 22–27; W. McDougall, *Outline of Psychology*, 1923, 1–19, 34–42; J. R. Angell, *Psychology*, 1908, 1–12, 80, 149; C. H. Judd, *Psychology*, 1917, 1, 12 f., 61–70. For a critical study of the consciousness psychologies, see: E. B. Titchener, "Functional Psychology and the Psychology of Act," *American Journal of Psychology*, xxxii, 1921, 519 ff.; xxxiii, 1922, 43 ff.

17. A. Comte, *Cours de Philosophie Positive*, i, 1830, 34 ff., iii, 1838, 774 ff.; J. B. Watson, *Behavior: An Introduction to Comparative Psychology*, 1914, 1–28; *Psychology from the Standpoint of a Behaviorist*, 1924, 1–21, 24 f.; A. P. Weiss, *A Theoretical Basis of Human Behavior*, 1925, vii, 127, 225 ff., 251; F. A. C. Perrin and D. B. Klein, *Psychology: Its Methods and Principles*, 1926, 14 ff., 19, 73 ff. For criticisms of behavior psychology, see A. A. Roback, *Behaviorism and Psychology*, 1923; E. B. Titchener, "On Psychology as the Behaviorist Views It," *Proc. Amer. Phil. Soc.*, liii, 1914.

18. H. C. Warren, *Human Psychology*, 1919, 1–16, 415 f.; R. S. Woodworth, *Psychology*, 1921, 1–10, 17 f., 46.

19. M. Bentley, *The Field of Psychology*, 1924, vi f., 1–20, 83, 153 f., 189 ff., 338, 355. This system is only in part empirical; when the author writes of the 'composition' and the 'organization' of 'experience,' he adopts another point of view which we discuss later (see below, p. 57 ff.).

22. Stout, *Manual*, 32; McDougall, *op. cit.*, 1, 38; Watson, *Psychology from the Standpoint of a Behaviorist*, 7 f.; Woodworth, *op. cit.*, 89, 419; Warren, *op. cit.*, 134 ff.; Bentley, *op. cit.*, 4 ff., 13 f.

23. Stout, *Analytical Psychology*, i, 1909, 162; W. James, *Principles of Psychology*, i, 1890, 299 ff.; McDougall, *op. cit.*, 253; Dunlap, *op. cit.*, 25; Witasek, *op. cit.*, 92 f., 100 f.; Bentley, *op. cit.*, 41, 44, 197 f.

24–25. Ladd, *op. cit.*, 7 f.; Angell, *op. cit.*, 3, 9; Stout, *Analytic Psychology*, i, 23, 144, 189; ii, 254; *Manual*, 18 ff., 398; Witasek, *op. cit.*, 85 f., 88 ff.; Pillsbury, *op. cit.*, 90 f., 198 f.; Warren, *op. cit.*, 117, 137 f., 413 ff.; Woodworth, *op. cit.*, 18; Watson, *op. cit.*, 1 ff.

CHAPTER III

GENERAL PSYCHOLOGY—*Continued*

Man does not consciously determine his method and then enter upon it; he enters blindly upon it and at a certain stage awakens to consciousness. . . . It would indeed go hard with mankind if they must act wittingly before they acted at all.—HENRY MAUDSLEY.

We have yet to consider a type of psychology which may be regarded as still in course of development. This type had its origin in physiology, and for many years those physiologists who nurtured it worked 'blindly,' for they did not in the least realize whither their efforts might lead. At length the relations between mind and the brain became better understood, the possibility of an experimental psychology emerged, and a gain in logical formulation was realized through defining psychology by point of view rather than by reference to objects. Later when, within the broader field of science, the conception of science as description was reached, certain psychologists accepted this lead and definitely set their faces in the direction of critical science. Serious problems of a logical kind remained, however, for the newer view demanded a more rigid logic than did the older empirical psychology. The solution of these problems proceeded slowly; the concepts of empirical psychology got in the way;

but at the present time the foundations of a psychology which seems to conform to the conception of critical science have been laid. Since nothing in the world of thought is more difficult than the attainment of a new point of view, the newer conception of psychology is difficult to comprehend. In the hope that its exposition may be made easier, we shall adopt the historical method and trace the growth of this view in greater detail.

26. Physiological psychology. About the middle of the nineteenth century physiologists began, among other things, the study of the relations between the brain and the mind; and this led to the investigation of many facts of a psychological nature. The movement did not, however, begin all at once. It was a long step from the old notion that the soul dwelt somewhere in the body, to the realization that mental phenomena are conditioned upon, or are functionally related to, nervous processes. One intermediate step was a doctrine known as phrenology, which held that the faculties of the soul were localized on the surface of the brain, and that the better developed faculties showed as cerebral bumps or protuberances which caused corresponding "bumps" in the hard bony skull. The theory had a great vogue, but its only merit was that it led to microscopical, anatomical, and physiological studies of the cells and fibers of the nervous system. Another intermediate step was the

investigation of the bodily and mental effects of injuries to and diseases of the brain. Still another was the beginning of experiments upon animals, in which portions of the brain were by operation removed, and the subsequent effects observed. Eventually, there appeared two important books—*Medical Psychology, or Physiology of Mind*, by Lotze;[1] and *The Elements of Psychophysics*, by Fechner.[2] These two books established for all time the dependency of mental experience upon the nervous system; the former dealt with psychological processes as connected with nervous processes, and the latter measured by experiment what was thought to be the relation between body and mind. We now know that, what was more important, Fechner demonstrated the possibility of mental measurement and, consequently, of a quantitative psychology. Further investigations, by physiologists, of many psychological phenomena, followed upon these two books. Thus, for example, Helmholtz studied the sensations of sight and sound; Weber and Vierordt, the perceptions of tactual space; and Helmholtz and Hering, visual space-perception.

Finally, in 1874, these movements converged in a broader and further-reaching conception embodied in a book called *Physiological Psychology*, by Wilhelm

[1] R. H. Lotze, *Medicinische Psychologie, oder Physiologie der Seele*, 1852.

[2] G. T. Fechner, *Elemente der Psychophysik*, 1860.

Wundt.[3] The result has proved to be so important for the subsequent history of psychology that we must try to understand exactly not only what Wundt meant by the term, but also the nature of his contribution to psychology. "The adjective physiological," he says, "implies simply that our psychology will avail itself to the full of the means that modern physiology puts at its disposal for the analysis of conscious processes." By this Wundt meant that, in the first place, the method of uncontrolled introspection common to the empirical psychology of his time he would replace with the exact procedures of physiology, which, however, would be "remodeled" and adapted as need be "to meet the specific requirements of psychological investigation." Moreover, he would, in the second place, employ the methods of psychophysics "to investigate the relations that hold between the processes of the physical and those of the mental life." The former, he thought, would result in an experimental psychology, *i. e.*, a psychology whose method, like that of physiology, was controlled observation; the latter would, as a supplement to experimental psychology, give a "knowledge of the bodily substrates of the mental life." Wundt insisted that physiological psychology is not a province of physiology. It is, on

[3] W. Wundt, *Grundzuge der physiologische Psychologie*, 1874; the quotations in the text are taken from the transl. of the first volume of the 5th edition, 1902, by E. B. Titchener, *Principles of Physiological Psychology*, 1904, 1 ff.

the contrary, "first of all *psychology*." Furthermore, it does not "attempt to derive or explain the phenomena of the psychical from those of the physical life." "We may," he says, "read this meaning into the phrase 'physiological psychology', just as we might interpret the title, 'microscopical anatomy' to mean a discussion, with illustrations from anatomy, of what has been accomplished by the microscope; but the words should be no more misleading in the one case than they are in the other." Later authors, however, have employed the words 'physiological psychology' to mean a study of the relation between mental and physiological processes, not in the sense of psychophysics, which is merely quantitative, but in that of a causal relation, the physiological being regarded as an explanation of the psychological processes. In this sense the term is still employed in France, where the expression 'objective psychology' has also been used with the same meaning. The phrase is falling into disuse, however; it has done its work in emphasizing the dependence of mental experience upon neural processes, in pointing the way to the experimental control of psychological observation, and in holding experimentation to those processes most easily controlled until the theory and procedures of experimental psychology could be firmly established.

27. Experimental psychology. Wundt's service to psychology was twofold. In the first place, as we have

seen, he laid down an exact method by means of which psychological facts of general validity can be obtained. In the beginning, however, he was much more interested in the application of the method and the discovery of facts than in systematic formulation. His attitude was that of the science of his day, of which he had intimate knowledge; he founded a laboratory, the first in the world, for psychological investigation; and as his facts multiplied, he attempted to formulate their laws. He thus founded an experimental psychology, a psychology based not on casual observation and argumentation, as was the empirical psychology of his time, but upon experimental facts. In this way he changed the whole face of psychology, for empirical psychology also was quick to take advantage of his experimental procedures. In the second place, Wundt realized from the beginning that the various sciences deal with the same objects but from different points of view. In later years, he characterized the point of view of psychology as "immediate experience", and that of physics as "mediate experience." By this he meant that psychology deals with experience as it directly or immediately comes to the individual, whereas physics deals with the same experience after the psychological aspect has been abstracted. The experience, for example, which we call 'red' is immediately experienced as a quality and intensity. If these are abstracted, there remains what in physics is called radiant energy of a particular

wave-length and frequency. This characterization of the two attitudes has not been generally accepted; but he had an insight, a point of view, the rationalization of which could not be finally made in his time, and perhaps cannot even to-day. By virtue of his conception of psychology he was, nevertheless, able to claim for his science a large number of facts about sensory experience which other scientific investigators had discovered in the course of many years. This was possible because those facts did not belong either to physics or to physiology, for neither deals with sensation or perception as immediate experience. Strictly speaking, they also did not belong to empirical psychology; for it regarded sensations as signs, as qualities of objects, as bits of knowledge, and it considered perception as a higher stage of knowledge. Physics and physiology, on the other hand, tended to describe sensations, at least, as qualities and intensities. Wundt, by considering them as immediate experience, claimed them for psychology; and by accepting sensations and feelings in their own right, as experience to be described and correlated with the nervous system, he pointed psychology in a new direction. Did Wundt, then, clearly envisage a different psychology? The answer is that he did so in part only. So long as he was concerned with the simpler forms of experience, such as could be correlated directly with the sense organs, he described them not as sensations of something else, not as meanings, but as qualities and intensities.

When, however, he turned to the more complex types of experience, to ideas and volitions, he was unable completely to avoid the old and familiar conceptions. The reason for this we need not now consider; at present it is enough to see that, although he made a determined effort to break away from the empirical psychology which he inherited, he was not entirely able to accomplish it.

The next attempt to state the point of view of psychology was made independently, and approximately at the same time, by Avenarius and by Mach. The latter, an eminent physicist, was also one of the first to declare that the problem of science was merely description. Consequently, Mach faced the problems, both of physics and of psychology, from the standpoint of critical science. He regarded the world as consisting of an indeterminate number of indifferent (neither material nor mental) elements, such as colors, sounds, temperatures, pressures, spaces, times, which " are connected with one another in manifold ways; and with them are associated moods of mind, feelings, and volitions." Those complexes of " colors, sounds and pressures, etc., connected in time and space," which have a relatively great permanency, receive special names, and are in general called 'bodies.' Among these 'bodies' is one, the human organism, which when combined with a complex of memories, moods, and other feelings, receives the name of 'I'. Since the 'I' is a 'body' like all others in the world,

the distinction formerly made between the 'I' and the objects of the outer world disappears, and the various sciences describe these 'bodies' by assuming different points of view. "A color", he says, "is a physical object, so long as we consider its dependence upon its luminous source, upon other colors, upon heat, upon space, and so forth. Regarding, however, its dependence upon the retina, it becomes a psychological object, a sensation. Not the subject [matter], but the direction of our investigations, is different in the two domains." [4]

Avenarius, working from a different set of principles, came out with practically the same conclusion. "Psychology", he writes, "consists in all experience, from the point of view of its dependence upon the individual;" and the individual he further defines as the nervous system.[5] The term 'dependence' means, for both authors, a logical or functional dependence in the mathematical sense, such that if, of two factors, the one varies, the other does also. We may, for example, take the world of sound; when the experience is dependent upon an ear, together with its nervous connections, it is a subject matter of psychology; if a

[4] E. Mach, *Contributions to the Analysis of the Sensations* (1886), transl. by C. M. Williams, 1897, 2 ff., 5th edition revised by S. Waterlow, 1914, 2 ff., 46 ff.

[5] R. Avenarius, *Kritik der reinen Erfahrung*, 1888–90, 33; Bemerkungen zum Begriff der Gegenstände der Psychologie, in *Viertelj. f. wissensch. Philos.*, xix, 1895, 16 f.

change occurs in the ear (or in the sound), a change also occurs in the sound (or in the ear).

The first attempt to write a system of psychology from the point of view of Mach and Avenarius, was made by Külpe.[6] He defined psychology as the "science of the facts of experience in their dependency upon experiencing individuals;" the individual is for him the "corporeal individual," and the dependence is of the logical or functional kind. Külpe states further that the problem of psychology, as of all science, "is the description of facts;" psychology cannot explain its phenomena in the causal sense, but it should correlate its facts with processes of the nervous system; the latter are, however, regarded as the conditions of the former; and a psychological theory is, accordingly, "the specification of the conditions of the appearance of a given phenomenon." In Külpe's book there is no reference to mental activities; we find only sense impressions and feelings, qualities that vary in intensity, in duration, and (some of them) in extent. A sound, for example, is an auditory quality which may be loud or soft, and long or short. These psychological attributes are, in various ways, connected in complex experiences like perceptions, ideas, and emotions. Certain tonal qualities, for instance, are found fused in the musical chord;

[6] O. Külpe, *Outlines of Psychology* (1893), transl. by E. B. Titchener, 1909, 1 ff., 88, 142, 293, 361; *Introduction to Philosophy* (1895), transl. by W. B. Pillsbury and E. B. Titchener, 1901, 58 f., 124 f., 204.

or "the perception of the figure of an object is reducible to the perception of a sum of extensions." All this has the ring of critical science; it sounds like sheer description of what is observable. He did not see, however, that a musical chord is, in fact, something more than a mere fusion of certain auditory qualities, or that the figure of an object is again more than the perception of a sum of extensions. The former bears the meaning of 'musical chord', the latter that of an object. How the 'chordness' or the object-character of the figure could have resulted from a fusion of qualities or a sum of extensions, is a question which apparently did not occur to him. Furthermore, the attributes are, for him, something more than mere aspects of the given; they are also significant. If this were not the case he could not say, as he did, "That a sensation serves as the symbol, or brings us knowledge of external stimuli, may be due to its intensity, duration, etc., just as well as its quality." Or, again, "only the articular sensibility can furnish exact information of extent of movement [of a limb]; . . . it alone can arouse a visual idea or a direct judgment or a change of position." Granting that Külpe is consistently regarding experience as conditioned upon the corporeal individual, his results are not always scientific in the critical sense—his facts are meaningful, they point to something beyond themselves. Although the temper of his book is strictly scientific, and although the logical difficulties of

defining psychology by subject matter are avoided by a definition in terms of a point of view, his psychology is still, in part at least, of the empirical kind. It is not enough, apparently, to define by point of view in order to attain a scientific psychology in the critical sense. Wundt, as we have seen, also failed. Furthermore, the English psychologist and philosopher, James Ward, defined psychology by point of view as " the science of individual experience," and then wrote an empirical psychology of the consciousness kind.[7] We must conclude, therefore, that if meanings and values are to be eliminated, and psychology is to become a science in the critical sense, something more than a characterization of the special attitude of psychology is needed.

28. Existential psychology. This difficulty was first clearly seen by Titchener.[8] He accepts the characterization of the attitude of psychology as given by Mach and Avenarius, but he requires also, as antecedent to or as part of the attitude of psychology, that of science as a whole. This is to say that if, *within the attitude of science* taken in its critical sense, the whole of experience be *further* considered as logically dependent upon the nervous system, there may be expected to result a subject matter which is existential, which is not described by any other science,

[7] J. Ward, *Psychological Principles*, 1920, 28.
[8] E. B. Titchener, *A Beginner's Psychology*, 1915, 8, 26 ff., 117 ff.

and which consequently may serve as the subject matter of a scientific psychology. From what has been said of the attitude of science as a whole and of that of the special sciences, it would appear that Titchener has in this way met the difficulty and that we should not, upon assuming his attitude, expect meanings and values to appear as subject matter of psychology. Titchener could not, however, take this for granted. Throughout the history of psychology it has been held that meaning is intrinsic to sensory experience, that sensations in and of themselves refer to the external world, and that feeling in the same way refers to the state of the organism. It cannot, therefore, be *a priori* assumed that the scientific attitude would, in psychology, give sense impressions without their meanings. Titchener has shown, however, both by experiment and by reference to daily experience, that meaning is not intrinsic to the content-process, that meanings may be put on and off a process, that an experience and its meaning may be disjoined in time, that one and the same experience may have several meanings, that one and the same meaning may attach to several experiences, and that meaning and mental-process are not co-variants. It is true, of course, that the observer is, in psychology as in other sciences, a knowing creature; to observe, therefore, implies apprehension; consequently, in this sense a mental process means. We have here, however, to distinguish two kinds of meaning: the

meaning which refers beyond the process to an object, and the meaning which refers only to the process itself; this bare experience thus referred to is the descriptive fact of science.

We have still to ask how Titchener accounts for the 'something more' which Külpe disregarded in his analysis of the musical chord and of the figure of an object. In the first place, Titchener grants that meaningful experiences are, when psychologically regarded, patterns or configurations of simpler processes, and that an adequate description requires a report not only of the simpler processes that are present, but also of the nature of the configuration. In the second place experiment shows that a configuration contains certain processes directly correlated with the meaning, and that they are added or accrue to the processes which are directly excited by the stimulus. If an illustration will help to make this clear, let us suppose that we have an experience which for the purpose of report we call a warmth. Under the psychological attitude, it is only a quality which may be described as such. Let us suppose further that this quality means 'fire.' The description of this now meaningful experience will result in a report of the 'warmth' and also of some other process—a visual, auditory, or any other quality—which is found to appear together with the meaning and therefore may be regarded as the psychological correlate of the meaning.

Before we go on to inquire whether this psychology

meets all the requirements of critical science, we may ask in greater detail what kind of psychology results. In answering this question we note first that all 'acts' and 'functions' have disappeared; there are no states of consciousness, no objects of which we are conscious. There are only sensory processes which are excited either by external stimulation or, as the case may be, by internal stimulation, *i. e.*, in the brain. It will be recalled that, in our discussion of the logical difficulties which pre-scientific psychology found in selecting its subject matter, it was these sensory processes which gave it the most trouble. Throughout the history of empirical psychology they have given no less trouble; they have been relegated to physics, they have been called phenomena which are neither physical nor psychological, they have been named objects of consciousness and contents of acts, they have been regarded as forms of knowledge, they have been considered as necessary antecedents to knowledge; but, with rare exceptions,[9] they have nowhere in empirical psychology received consideration in their own right. Now they have become the sole subject matter of psychology. As qualities they occur in almost infinite variety; for they constitute the world as it is visible, audible, and palpable, as it is

[9] H. Ebbinghaus, *Grundzüge der Psychologie*, i (1902), 1905; M. Bentley, *The Field of Psychology*, 1925. In Chapters III–VI, inclusive, of the latter work the author conforms closely to the existential point of view.

redolent and sapid. They vary in intensity, in duration, in extensity, and in vividness; they are found blended, fused or conjoined in qualitative, intensive, durative, extensive, and attentive patterns, and in combinations of these. In both their variations and their integrations they are measurable.

It is the problem of existential psychology to describe this world; and description consists in the analysis of the complex into simpler processes, their classification, the determination of the laws of their occurrence and of their integration one with another. The task of the psychologist includes also the correlation of mental and neural processes; but this correlation implies no causal connection; the two kinds of processes are, it will be recalled, merely logically related. It happens, however, that the present status of psychology is more advanced than that of sense physiology. Consequently, the correlations of psychology have thus far been almost entirely physiological theories. The theory of vision, for example, relates solely to hypothetical processes which occur in the retina and the brain. These theories have proved helpful in suggesting experimental work of purely psychological nature, and they are also useful in holding together the psychological facts themselves. It is probable, however, that when existential psychology has gained a higher stage of development, correlation will cease to be a problem for systematic psychology, although it will still have a place in the logic of experimentation.

The method of psychology, for Titchener, is observation; if he employs the term 'introspection,' he warns his reader against its empirical meaning of looking into one's self or of observing the working of one's own mind; there is, for him, no difference between psychological observation and that in any other science; and the term 'introspection' is employed solely in reference to the particular attitude of the psychological observer. This follows logically from his scientific position. Since the facts mean only themselves, they are *impersonal;* they cannot also mean either 'mine' or 'not mine.' The 'red', for example, which the existential psychologist describes is not 'his' 'red'; it is not his experience any more than the radiant energy which the physicist describes is 'his.' There is, of course, no reason why with a shift of attitude the meaning of 'mine' or of 'fire', of 'anarchy', of 'danger', or any other meaning might not be put upon the given process; but the shift of attitude takes the individual out of science and into common sense; there is no 'mine' or 'fire' or 'anarchy' or 'danger', in either psychology or physics.

We may now ask whether a psychology of this kind meets the demands of critical science. From what has been said it appears that existential psychology has in fact assumed the attitude of critical science; does psychology also as a system of knowledge conform to the other characteristics of critical science? It, in the first place, distinguishes its facts from the declara-

tions of common sense; its facts are meaningless in the sense that they do not of themselves refer beyond themselves, whereas common sense lives and moves in a world of meaning. Its facts are also communicable and verifiable. Psychological experimentation has shown that a number of different individuals under the same physical and physiological conditions have the same or similar psychological experience, and are able to describe it in a fashion intelligible to still other individuals. It should be remembered, however, that just as biological organisms vary and the facts of biology are, therefore, distributive, so psychological facts which are conditioned upon the biological individual, are also distributive. This concept of distribution we shall have to investigate later.

Secondly, its problem, like that of critical science, is description. It does not attempt explanation except in so far as it subsumes observed fact under some law. The fact that 'red' undergoes qualitative change in time with steady fixation, is thus explained by the law of adaptation; but this law does no more than generalize what, under the stated conditions, happens to all visual qualities.

Thirdly, having assumed the attitude of critical science, it follows that existential psychology does not confuse its method of observation with the 'observation' of common sense. Its method is also the same as that of other sciences. The fact that physics and biology mainly employ the eye in observation, and

psychology uses all the senses, need not be disturbing. Physics and biology also make observation by ear, and chemistry frequently by taste and smell. Physics might make its measurements with instruments constructed to be read by pressure or pain organs, but probably they would not be as convenient as those they now employ.

Finally, the goal of existential psychology is in general the same as that of critical science—to know the existential world for its own sake. Its particular goal is a systematic account of this world as regarded from its own point of view. It is not concerned with the value of its findings. It is true that Bentley regards psychological 'experience' as one of the two essential agencies of mental functions, as one half of the mind-body individual; but, however true this may be, its consideration is a problem of empirical, and not of existential psychology.

29. Summary. This completes our survey of General Psychology. We set out to discover what psychology is at the present time conceived to be, and in what sense it can be a science. We have found that contemporary views fall into two groups. The one which we have called empirical psychology takes, in general, a particular kind of experience as its subject matter, although it may also be defined by point of view. There is, however, considerable disagreement as regards the subject matter of empirical

psychology. It is said to be the phenomena of consciousness, bodily behavior, and both conscious and bodily responses or functions; in every case it is a kind of activity, and the active agents are mind (or the self that has the mind), or the biological organism, or a total psychophysical or mind-body individual. Its particular method varies as its subject matter, and it is characteristic that both its subject matter and its method are not distinguished from those of common sense. Its problem is to furnish a theory of conduct, and in its theory the principle of causation or explanation plays an essential part. Its goal is to benefit humanity. In all these respects empirical psychology bears the marks of a science in the traditional and popular meaning of the term.

The other group comprises a series of views which originated in an effort to break away from empirical psychology and to found a science on observed fact obtained by controlled experimentation. It is characteristic of these views that psychology is defined solely by point of view, that the subject matter of psychology is the whole world of experience regarded from a particular aspect. We have found a progressive development in the characterization of the attitude of psychology until at last one has been found which seems to result in a subject matter that conforms, as do its method, problem, and aim, to that of the critical conception of science. We have called this view Existential Psychology.

Supplementary Readings for Chapter III

Paragraph

26. G. T. Ladd, *Elements of Physiological Psychology*, 1887; G. T. Ladd and R. S. Woodworth, *Elements of Physiological Psychology*, 1911; T. H. Ziehen, *Introduction to Physiological Psychology*, 1892; H. Maudsley, *Physiology of Mind*, 1893; W. Bechterew, *La psychologie objective*, 1913.

27. W. Wundt, *Grundzüge der physiologischen Psychologie*, 6th ed., 1908–10; *Outlines of Psychology*, transl. by C. H. Judd, 1896; *An Introduction to Psychology*, transl. by R. Pintner, 1912.

28. E. B. Titchener, *Lectures on the Elementary Psychology of Feeling and Attention*, 1908, Lecture I; *Lectures on the Experimental Psychology of the Thought Processes*, 1909, 7 ff., 29, 37, 174 ff., 194; *Text-Book of Psychology*, 1910, 6, 16, 19 ff., 367 ff., 517; "Psychology: Science or Technology?" in *Pop. Sci. Mo.*, xxxiv, 1914, 39–46; *A Beginner's Psychology*, 1915. Titchener's last formulation of the definition of psychology has not, at this date, been published. There is, however, nothing in the present chapter that is not implicit in his published writings.

CHAPTER IV

SCIENCE AND TECHNOLOGY

Science and technology are, first of all, different. Science is defined by its point of view; the man of science takes his stand at the handle of the fan, and looks out along the sticks to an undefined periphery. Technology is defined by its practical end; the technologist, moving over the periphery, chooses and shapes the sticks which are to meet at the pivot that he has always held in view.—EDWARD BRADFORD TITCHENER.

30. The concept of technology. At the close of our discussion of the goal of science from the critical point of view (p. 18) we remarked that the question of the relation of scientific knowledge to practical ends is an important one which we must later consider. We now turn to that question. In books and articles dealing with this question we frequently find 'science' qualified by the adjectives pure, theoretical, and applied. Furthermore, 'applied science' is employed at times as synonymous with science, at other times with art, and at still others with technology. We must, therefore, before we attempt to answer our question, come to some decision as regards our terminology.

Occasionally 'pure science' refers, as it originally referred, to mathematics and logic which, because they were considered as based upon axioms or self-

evident truths instead of observed facts, were regarded as pure reasoning. Since, however, mathematics is now said to be applied logic, and logic itself is no longer, except in popular thinking, regarded as a science, the term pure science is, in this sense, an anachronism. In general both 'pure' and 'theoretical science' are employed in the negative meaning of science that is not applied. Even when, as sometimes happens, 'theoretical science' is positively defined as the science of general principles or laws, the negative is still implied, *i. e.*, to deal with general laws is not to deal with concrete or particular instances; and this is just the thing that applied science must do. Furthermore 'science' itself deals with general laws and is an adequate term for expressing the antithesis of applied science. The qualifying adjectives are, therefore, unnecessary.

The term 'applied science' derived from the classificatory expression 'applied sciences' which originally, as we shall later see, designated certain disciplines which had long been known as 'arts.' The word 'art' has always, in this context, meant skill in the application of knowledge, and formerly 'science' had practically the same meaning. When, however, the latter took on its special, the former retained its original meaning; the central idea of science having become systemized knowledge, that of art, while still including knowledge, continued as skill in application. It is in these senses that we still meet the double

term as, *e. g.*, the art and science of music, the art and science of medicine. The word technology arose in the sense of a treatise on an art or the arts in general; that is to say, a systematic study of the theory, the knowledge, and the rules by means of which the practical object or end is to be reached. In the early stages of an art the knowledge was derived from practical experience, and the theories were deduced from the beliefs and explanations of common sense. As science developed, however, it became evident that both the knowledge and the theories of the arts were somehow utilizing those of science; the arts, in other words, were taking on a scientific character, and a new term which would express this change seemed desirable. Thus it was that Cuvier in his celebrated report on the progress of the natural sciences between 1789 and 1808 coined the terms 'practical sciences' and 'applied sciences' and he employed them as classificatory terms for medicine and agriculture which he regarded as "only the general application of physical knowledge to the most pressing needs of man."[1] He also recognized not only that both of these practical sciences derived their theories, at least in part, from animal and plant physiology and pathology, but also that they could not disregard any theory upon which these sciences themselves were based. A few years later Herschel, in an attack upon the same problem as that of Cuvier,

[1] G. Cuvier, *Rapport historique sur les progres des sciences naturelles depuis 1789, et sur leur état naturel,* nouvelle ed., Paris, 1827, 303.

wrote, "Art is the application of knowledge to a practical end. If the knowledge be merely accumulated experience, the art is *empirical;* but if it be experience reasoned upon and brought under general principles, it assumes a higher character, and becomes a *scientific art.*"[2] Herschel's expression 'scientific art' was not a happy one and has not gained acceptance. The term art has, however, in so far as its knowledge is concerned, become restricted to those disciplines which deal with accumulated knowledge in Herschel's sense; and applied science and technology are employed for those disciplines whose experience is "reasoned upon and brought under general principles."

Applied science has, however, come to mean the application of the knowledge of some one science to practical ends, *e. g.*, applied mechanics, applied chemistry, applied psychology. There are three ways in which a science may perhaps be applied: first, the theories of an applied science may be derived from, or bear a resemblance to, the general laws of some special science. For example, the theories of mechanical or electrical engineering are physical, those of medicine and agriculture are biological, those of education and clinical psychology are psychological in nature. In few if any of these cases, however, is a scientific theory taken over into applied science with-

[2] J. F. W. Herschel, *A Preliminary Discourse on the Study of Natural Philosophy*, 1831, 53 f.

out modification or adaptation to particular ends. Secondly, it may be that applied science acquires the procedures of some one special science. This again seems to be the actual occurrence. Chemical engineering, for instance, uses the same experimental procedure as chemistry; mechanical engineering as physics; medicine and agriculture in general as biology; education and industrial psychology in general as psychology. There is, on the other hand, no technology which does not either invent procedures of its own or borrow from any science procedures that will help to solve the problem in hand. Thirdly, it may be that applied science employs solely the facts of one special science. This, however, is never the case; there is, as we shall later see, no body of practical knowledge that applies solely the results of any one science. In the sense, therefore, that 'applied science' is the application of the knowledge of some one science to practical ends, the term is equivocal. There are other ways, however, in which the term applied science is unsuitable. For the applied sciences have never completely lost their character as arts. Furthermore, they not only, when possible, borrow knowledge from the sciences but they also employ on their own behalf, the methodical procedures of science to obtain new knowledge. To call these disciplines applied science in the sense that they are merely applications of scientific knowledge to practical ends is, therefore, not only misleading but it robs them of one of their greatest achievements—

the discovery of a vast amount of useful knowledge. The term 'technology', on the other hand, which is often employed in place of 'applied science', has always been a general term for the systematic study of the theory, the knowledge, and the rules for attaining practical ends, and it has also acquired the technical methods of science. We shall, accordingly, employ it as a better descriptive term than 'applied science'. There are many technologies; and we shall now have to examine them, their theories and problems, their methods and aims. We have not only to justify some of the statements we have made above, but also to find a basis for determining their relation to science.

31. Definition of technology. Technology cannot be defined, just as science could not be, in terms of a particular subject matter. Medicine, according to Huxley, requires a knowledge of physics, chemistry, physiology, histology, pathology, general biology, anatomy, morphology, bacteriology, and medical jurisprudence;[3] and to-day we should have to add to the list botany, psychology, and the results of medical experimentation. Civil engineering in the same way borrows from physics and chemistry, from geology, bacteriology, metallurgy, astronomy, from mathematics and logic, from other technologies, from com-

[3] T. H. Huxley, "On Medical Education, The State and the Medical Profession, The Connection of the Biological Sciences with Medicine," in *Science and Education*, 1894, 303 ff.

mon sense, and from any other source that will assist it in the solution of its particular problems. "Forestry," says W. Dawson, "is a composite subject applying the principles of many sciences." [4] Not to multiply catalogues, we may reverse the picture. "It is no exaggeration," writes a secretary of the Geological Society of London, "to state that there is hardly an industry or art that has not been and is not aided directly by the knowledge that geology has accumulated, and that is not in some measure dependent upon geological knowledge for its successful continuance." [5]

Technology can be characterized only in terms of its aim or goal, and the different technologies are distinguished by their particular aims or goals. Civil Engineering, for example, aims at the theory and construction of bridges, railroads and highways, water supplies and sewerage systems, dams and irrigation projects, and the like; Mechanical Engineering deals with the theory, design, and construction of machines and engines; Agriculture with the production, the increase, and improvement of crops, the breeding and care of domestic animals; Medicine with the diagnosis and cure of disease and the maintenance of health, and so on.

[4] W. Dawson, "Science in Forestry," in *Science and the Nation*, ed. by A. C. Seward, 1917, 145.

[5] H. H. Thomas, "Geology as an Economic Science," in *Science and the Nation*, 1917, 207.

32. Technological theories. The problem of technology is threefold. It has first to develop a theory of the particular kind of object which is its goal. Mechanical engineering has, for example, to construct a theory of the steam or the gas engine; medicine theories of health and disease; agriculture, theories of plant growth, and of plant and animal breeding. It is this problem which, as Thomson says, places applied science intermediate between a general or a particular science (a 'pure' science) on the one hand, and one of the arts or crafts on the other;[6] for it, as Clifford writes, involves thought of the 'scientific' kind.[7] In general, the solution of a theoretical problem is begun by the application of purely logical methods. The premises may be derived from accumulated knowledge, from chance observation, from the results of technological experiments, and from scientific laws. If, for example, the problem is mechanical in nature, the premises may usually be taken from the scientific laws of mechanics; since, however, the latter are general or ideal laws, they must be made to apply to the particular conditions involved, of which the theory must take account. This may require the employment of still other laws, which taken together with the first, answer to the conditions. Mechanical Engineering, to take an instance, cannot immediately apply

[6] J. A. Thomson, *Introduction to Science*, 1911, 115.

[7] W. K. Clifford, "On the Aims and Instruments of Scientific Thought," in *Lectures and Essays*, i, 1879, 126 ff.

the general law of gravitation without also taking into account the secondary law of resistance or friction. Pasteur, to take another instance, argued from the laws of fermentation, which he himself had established, to the microbic theory of disease. In some cases, a scientific law is itself taken over as a technological theory; thus Mendel's Law became the theory of systematic plant breeding.

All of these theories are, and must be, causal in nature; they are, in their essence, explanatory. An engineer must have a reason for every step in the design of his project. It was a causal relation between microbes and certain diseases that Pasteur envisaged. And so on throughout the whole of technology. How it is possible for a scientific law which is essentially descriptive to become a technological theory which is intrinsically explanatory; or, what relation the various theories of any one technology bear to the general point of view or theory of the science from which most of those theories are drawn, are questions which concern the relation between science and technology. We must consider these presently.

33. Technological experimentation. All technological theories are, of course, based upon knowledge; and if the technologist has not sufficient scientific knowledge upon which to build his theory he undertakes experimental investigations in the pursuit of knowledge

on his own account. This we may regard as a second problem of technology. In the solution of this problem the technologist employs both the logic and the experimental procedures of science itself; but he is guided, both in the selection of his subject and in the planning of his experiments, by his practical need; and his facts have a significance, a meaning, or value for his technology. It not infrequently happens that for a time, he ceases to be a technologist and, guided solely by his interest in the facts for their own sake, assumes the attitude of a man of science. Pierre Louis, a French physician, dropped his medical practice for seven years and devoted his whole time to the scientific observation of fevers. Pasteur went far beyond finding a remedy for the 'sick wines' of France, to the scientific investigation of fermentation.

Another kind of experiment, which is perhaps more typical of all technology, and which answers to its third problem, is the 'test' which comprises either the application of a 'critical' or 'crucial' experiment to a theory, or the application of practical standards to an object. An instance of the former is found in the investigation of the causes of yellow fever. Many theories were proposed; as, for example, that it was caused by various bacteria; that it was contagious; that it was infectious; and that it was transmitted by a species of mosquito, etc. Every one of these theories was tested by experiment, and by the method of elimination the adequate cause was ultimately found.

In the mechanical technologies, the efficiency of a machine or other object which is built according to some theory, is tested. No one could say whether the first Atlantic telegraph would work until it was tried. In many cases nature herself does the testing, as when Mother Ganges, in Kipling's tale, tested Findlayson's bridge; or again, as when a flood tests a dam, or a winter's frost tests the resistance to cold of a new plant. The application of practical standards constitutes a great part of technological research for the experimental determination of norms and rules, as for instance, the strength of materials, the electrical conductivity of various metals and alloys, rules for the control of noxious insects, norms of intelligence, the collocation of symptoms of disease, the therapeutic effects of drugs, rules for planting and growing crops—in short, the detailed information by means of which all technological theory and knowledge is finally reduced to practice.

34. Technology and traditional science. Technology would, therefore, seem to be a discipline drawing upon science for its theories and for part of its experimental technique; but whether it is independent of science depends upon the definition of science which we adopt. It is said at times that there is no fundamental difference between the two, or that if a difference is made out, it is "vague" and "artificial". Again, as Campbell puts it, "It is not, or it ought not

to be, the academic student in the pure refined air of the laboratory who makes the knowledge and the hard-handed and hard-headed worker who applies it to his needs. The man who can make real knowledge is the man and the only man to apply it."[8] Views like these are natural enough for those who hold the traditional notion of science. It was Bacon's idea that after laws were discovered by induction, the deductive process ending in practical objects should begin. Furthermore, since, as we have seen, traditional science considers its laws as explanatory, and since the theories of a technology are also explanatory, there is no reason why the latter should not, whenever it can, take its theories directly from the laws of traditional science. Technology is also justified in making use of any general doctrine like mechanism, vitalism, or spiritism, providing the doctrine shall be of service for the solution of its practical problem.

We may conclude, therefore, that the only essential difference between traditional science and technology is that the former is more general and stops with its explanations, whereas the latter shapes the theory and deduces the rules and norms that are necessary for the realization of the practical object which the theory explains. Traditional science may consequently be regarded as a preliminary stage and thus an integral part of technology.

[8] N. Campbell, *What is Science?* 1921, 183.

35. Technology and critical science. From the critical conception of science, however, there is a wide difference between the two. There is first, the difference in definition; the one defined by point of view, the other by aim or goal. Science, as the result of its point of view, comes out with a particular subject matter; technology, as a result of its aim, is directed toward a definite class of objects. They diverge even more with respect to the direction and visibility of their problems. "The applied sciences," writes Ostwald, "are distinguished from the pure sciences by the fact that they do not unfold their problems systematically, but are assigned them by the external circumstances of man's life."[9] When Titchener says, in our chapter-heading, that "the man of science takes his stand at the end of the fan, and looks out along the sticks to an undefined periphery,"[10] he means that the man of science stands with all his systematic knowledge in front of him, he selects a line of investigation and it leads him into the unknown; whereas the technologist, standing on the boundary between the known and unknown, selects and molds his knowledge or his problems with a definite object in view. Even when the technologist faces the unknown and searches for new knowledge he is still guided by the needs of his practical object.

[9] W. Ostwald, *Natural Philosophy*, 1910, 59 f.

[10] E. B. Titchener, "Psychology: Science or Technology?" in *Pop. Sci. Mo.*, lxxxiv, 1914, 50.

Critical science and technology are again dissimilar in the fundamental nature of their problem; the former seeks only to describe the world when stripped of its meanings and values; the latter, on the other hand, lives and moves in a world of value. This puts a new face upon the question concerning the relation between scientific law and technological theory. Since, as we have seen, traditional science regards its laws as explanatory there is, from this point of view, no difficulty. How it is possible, on the other hand, for technology to take a scientific law which—from the critical point of view—describes sheer existences and denies a causal relation, and regard it as a law of values or of explanation, is indeed a difficult question. What technology seems to do is to assign its own values to the terms of the simple description, and to assume causal connection where the scientific law states only correlation. Technology is able to do both of these because its 'proof' is neither logical nor observational, but rather the efficiency or usefulness of its ultimate practical object. Its theory may be wrong; but if the results are successful, its aim is accomplished. So also with causal explanation; if one cause fails, it has only to try another until a cause is found that produces the desired result. In the same way, technology finds, where 'critical' science cannot, a significance in prediction. It is of the utmost importance for the engineer to predict that his bridge will carry the load for which it is designed, for the

physician to make a successful prognosis, for the practical meteorologist to forecast a storm; whereas for science, as we have seen, a prediction is little more than a test of a law, or it is a methodological device.

If, however, the distinction between technology and critical science is accepted, it should not be forgotten that each is dependent upon the other. Science furnishes laws and experimental procedures which are useful to technology; and the latter pays its debt in improved instruments for observation, and in problems which, when investigated, enlarge the range of knowledge. They are, therefore, reciprocal and not antagonistic.

36. Technology and psychology. Since, as we have found, the traditional notion of science is coincident with the meaning of technology, and since as we have also seen, empirical psychology is science only in the traditional sense of the term, it follows that empirical psychology is, in intention, technological. We need not be surprised, therefore, to find Münsterberg saying, "The whole elaboration of causal psychology, and that is after all the form of psychology which is traditionally accepted as the science of the mind, has significance only if it is ultimately to serve our practical ends. . . . If we are to change the world, to reform and to improve men, to teach them or to cure them, to make them perform efficient labor or to organize them for common action, then we must treat man as a

system of causes which will produce certain effects. We must be able to foresee what will happen and to determine how we can mold the mind." [11]

Empirical psychology, it is true, is content to stop when it has furnished a theory of mind in use; it does not attempt to apply this theory in any methodical way. How the mental technologies are attempting to employ the empirical theories of mind in practical ways we shall see later when we come to the chapter on 'Applied Psychology.'

Supplementary Readings for Chapter IV

Paragraph

30–31. E. B. Titchener, "Psychology: Science or Technology?" in *Pop. Sci. Mo.*, lxxxiv, 1914, 46 ff.; I. Edman, *Human Traits and Their Social Significance*, 1920, 377 f.; N. Campbell, *What is Science?* 1921, 158 ff.

32–33. J. T. Merz, *History of European Thought in the Nineteenth Century*, i, 1904, 328 ff.; F. J. Branwell, "The Steam Engine," in *Science Lectures at South Kensington*, 1878, 111 ff.; E. R. Lankester, "The Sleeping Sickness," in *The Kingdom of Man*, 1907, 159 ff.; A. C. Seward, ed. *Science and the Nation*, 1917, 153 ff., 179 f., 267 ff.; D. Sanderson, " Scientific Research in Rural Sociology," in *Amer. Jour. Sociol.*, xxxiii, 1927, 177 ff.

34–35. J. A. Thomson, *An Introduction to Science*, 1911, 224 ff.; A. Hill, *An Introduction to Science*, 1900, 7 f.; A. C. Seward, *op. cit.*, 110, 207; J. T. Merz, *op. cit.*, ii, 1903, 207 f.; H. Poincaré, *The Foundations of Science*, 1913, 205 ff., 321 ff., 354 f., 363.

[11] H. Münsterberg, *Psychology: General and Applied*, 1914, 346.

CHAPTER V

DIFFERENTIAL PSYCHOLOGY

The body is domicilium animæ, *her house, abode and stay; and as a torch gives a better light, a sweeter smell according to the matter it is made of; so doth our soul perform all her actions, better or worse, as her organs are disposed; . . . the soul receives a tincture from the body through which it works. We see this in old men, children, Europeans, Asians, hot and cold climes; sanguine are merry; melancholy, sad; phlegmatic, dull; by reason of abundance of these humours, and they cannot resist such passions which are inflicted by them.*—ROBERT BURTON.

37. Individual differences. General Psychology aims at an account or description of mind wherever it is found. Since, however, mind is conditioned by, or logically dependent upon, the nervous system, and since nervous systems are individual and variable, mind is also individual and variable. This is, of course, obvious enough; we customarily speak of one mind as better or worse than another, as having a more or less stable attention, a slower or quicker apprehension, as more or less emotional or persistent than another. We recognize also differences in character, in temperament, in talent, and in many other traits. We know, too, that among individuals there are some who are alike either in the possession or lack of certain characteristics; some are deficient in

a particular mode of sensory experience, they are blind or deaf; others lack only certain qualitative arrays, they are partially color-blind, or they are 'pitch-deaf'; still others possess dominantly a particular kind of imagery, they belong, we say, to an ideational type. Variation within a wider range of characteristics, gives types like those of the idiot, the imbecile, the normal, the genius, and the insane. Finally, we assume typical differences that are the result of age, of racial inheritance, and of phylogenetic stages such as those of the animal and the human individual. Mind, then, is distributive; and although the facts and laws of general psychology should, as we have said, describe or be adequate to any mental experience without regard to its individual forms and variations, we have also a differential psychology, the study of the modes of distribution of mental experience in and among individuals. The various aspects of Differential Psychology will occupy us for several chapters, since they include many of the special psychologies, *e. g.*, the psychology of the abnormal, of the child, and of the adolescent mind; even animal psychology may be regarded as a branch of Differential Psychology. At present, however, we must inquire into the more fundamental problem of individual differences; we must ask what, exactly, is the nature of the individual; what are the characteristics that differ; and what are the particular problems of Differential Psychology. We shall have to deal with

the discussions of these questions as we find them; and then, when we have their answers before us, we shall consider them from the various points of view which we have found in General Psychology. It may, however, help us in our orientation to know that the accounts of individual differences are written almost entirely from the technological point of view, *i. e.*, in the interest of education, medicine, and sociology. The kind of mind with which we shall have to deal will, therefore, be that of Empirical Psychology, and almost exclusively human.

38. The nature of the individual. The individual, according to Stern, the founder of Differential Psychology, consists of a number of constituent parts, but it cannot be resolved into them; it is an indivisible unity, not a mere aggregate. "Its unitariness is empirically revealed in a completeness of form, in the purposefulness of its function, and in the unity of its self-consciousness." If, over and above its unitariness, it shows some unique peculiarity it becomes an 'individuality' or, as it is most frequently called in America, a 'personality'. This definition, although it purports to be empirical, is largely philosophical; the experimental investigations themselves show that the purposiveness of the individual is a characteristic read into it, and that the individual is by no means always self-conscious. The 'individual' with whom we shall be concerned is, in fact, identical with the

one with whom we daily come into contact, the man whom we meet in the street. It is a total psychophysical individual, generally of a certain age (youth or adult); its sex is frequently, though not always, ignored; and it reveals itself in a multitude of different kinds of experience and of accomplishments or performances which vary in quality and degree. We shall learn more about this 'individual' as we investigate the nature of its variable factors.

39. The variable traits. These factors or, as we shall hereafter for the sake of convenience call them, the traits by means of which individuals are or may be differentiated, are literally innumerable. Any kind of sensory experience, of 'mental' act or physiological function, of human form or behavior, if it is found to vary in quality or degree, may serve as a trait. A sample taken at random from various studies of individual differences, includes intelligence, energy, leadership, originality, strength of grip, musical talent, height, weight, memory, thriftiness, honesty, tolerance, invention of stories, ability to spell, reaction time, ability to copy lines of a standard length, sensitivity to pain, ability to draw, and temperament. Some of these, *e. g.*, intelligence and musical talent, are gross or complex and include many simpler traits. Intelligence comprises such things as simple apprehension, knowledge of familiar objects, ability to recite a list of numbers after a single hearing, ability

to solve problems of various kinds, etc.; musical talent may be made up of a 'sense of rhythm,' 'sense of pitch,' ability to differentiate discords and concords, ability to distinguish and remember musical motifs and phrases, and the like. Other traits, such as ability to spell and sensitivity to pain, seem to be simpler traits. Certain traits are measurable; strength of grip, reaction time, height, and weight, may be measured directly by physical units; intelligence, ability to spell, memories of various kinds, and similar traits, may be measured by degrees of success or failure in test experiments designed for the purpose. Others, again, like originality, honesty, tolerance, temperament and the like, although they seem to have degrees, are so complex and vary so much within a single individual that they are not easily measurable. Finally, some traits seem to be innate, and may perhaps be inherited; others are acquired during the lifetime of an individual, as the result of injury at birth, disease, malnutrition, education, practice. Stern has attempted a more general classification of traits, which is useful because it implies the total psychophysical individual. He finds three groups, which he calls Phenomena, Acts, and Dispositions. The first includes not only mental phenomena such as sensations, ideas, and feelings, but also physical phenomena such as behavior, bodily states, neural processes, and still others which derive from the organization of the individual. The acts comprise not only the mental

activities of the older empirical psychology, but also functions of the total individual which cannot be regarded as either purely mental or purely physiological. The 'dispositions', again, are not the hypothetical mental dispositions of the consciousness psychologies nor are they the neurological dispositions of explanatory psychology; they are rather dispositions of the individual regarded as a whole, as for example, the ability to adapt to an environment, to imitate other individuals, and the like.

Traits are variable in several different ways. Within a single individual some traits appear more prominently than others; there is an intravariation. In two or more individuals some one trait may be present in different degrees; there is then an intervariation. Since both of these are variations among traits, they are sometimes called 'partial variations.' Finally, individuals regarded as wholes may vary from other similar individuals, in which case there is a total variation.

The problems of Differential Psychology roughly fall into three groups. The first has to do with the general subject of variation, and divides into several subsidiary problems. The second is to investigate the conditions of variations, as, for example, the influence of heredity, of education, of social status, of sex, of age. The third problem is to examine, classify, and explain the characteristic expressions of individual differences, as shown in handwriting, characteristic gesture, physiognomy, and literary style.

40. Variation: Range and distribution of traits. The first of these problems is, if not the most important, the one that most fully occupies students of individual differences. It has, in the first place, to determine the range and distribution of single traits in a large number of individuals. It begins by finding or devising a test which shall serve as a measure of the trait to be investigated. This test must then be applied to a sufficiently large number of individuals to permit a statistical treatment of the results. The scores which all the individuals have made in the test must then be set in array, and a central value, such as the arithmetical average, the median, or the mode, determined; this value is regarded as a 'central tendency,' *i. e.*, the tendency of all scores to center on, to assemble about, one point. The next step is to find the way in which all of the remaining values group themselves about this central tendency; it may be that they will be found closely grouped about it, in which case there is a narrow range of variation; or again, it may be that they are widely distributed above and below the central value, when there is a wide range of variation. If all extraneous conditions are ruled out of an experiment of this kind, we should expect an approximately equal number of scores on either side of (above and below) the central tendency; that more scores would approximate to the central than to any other value; and that, as the scores get progressively smaller on the one side and larger on the other, the relative

frequencies of their occurrence would grow smaller. In other words, we should expect a 'normal' distribution. This form of distribution is so important for the logic of individual differences that we shall risk an illustration in the hope of making it clear. If we should measure the heights of all the men in a large university, and then, by means of the system of linear coördinates, plot the frequencies with which every particular height occurs, the abscissæ representing the various heights arranged in order from least to greatest, and the ordinates representing the frequencies, we should expect the resulting curve to have the familiar 'bell' shape of the 'curve of error.' If the 'bell' is thin and tall, variations from the central tendency are not great; if, on the other hand, the 'bell' is broad and low, variation is more extensive. As a matter of fact, the form of distribution rarely, if ever, assumes this normal or ideal form. The central tendency may be skewed to one side, in which case the 'bell' would be steeper on one side and sloped on the other; or the distribution may show two or more central tendencies—a large, and one or more smaller 'bells', *i. e.*, the curve may be bimodal or multimodal. We shall return to this latter kind of distribution. Whenever the form of distribution approximates to the normal type, it is possible by statistical methods to compute the amount of dispersion or scatter on the two sides of the central tendency, and thus obtain a value which shows the significance of any individual score in rela-

tion to all of the others. If, for example, the average grade of a class is 60, a grade of 50 has one meaning if the lowest mark in the class is 35 (the range is narrow), and it has another meaning if the lowest mark is zero (the range is wide).

Before leaving the general problem of distribution we have still to consider the question of constitutional types. It has, for centuries, been supposed that individuals fall into groups sharply separated from one another by particular and unique traits. In general, these traits run in pairs, and are mutually exclusive. For example, the slow and the quick wits; the naïve and the sentimental, the subjective and the objective, the tender-minded and the tough-minded, the intraversive and the extraversive types. At times these traits are regarded as complex, the result of a crossing of pairs of simpler traits. We give two examples of these in their schematic arrangement; the upper one was made by Galen (130–200 A. D.), the famous Greek physician; and the other, by Kant in a book on anthropology written in 1798. (See p. 96.) Both, it will be noticed, are classifications of the temperaments into a set of four traits, the names of which are derived from Hippocrates' theory of the natural constitution of the body (blood, sanguine; phlegm, phlegmatic; yellow bile, choleric; black bile, melancholic). Many similar classifications have been devised; some of them are still more complex and give rise to as many as twelve different temperaments.

Whether they are simple or complex, however, they nearly always run in pairs or multiples of two.

Classifications of Temperaments

GALEN	Strong	Weak
Quick	Choleric	Sanguine
Slow	Melancholic	Phlegmatic

KANT	Feeling	Activity
Sensitivity	Sanguine	Choleric
Apathy	Melancholic	Phlegmatic

The doctrine of types, in this form, has recently become suspect; not only because it bears the marks of logic rather than of experience, but also because the experimental studies of the distribution of traits seem to disprove it. If some individuals possessed a trait in high measure and others had none of it, we should expect high scores from the first group and zero scores from the second; the curve of frequency of distribution would consequently be discontinuous. There are, it is true, curves of this type; but they occur only in measurements of acquired traits such as knowledge of a special kind, certain habits, skills of particular kinds. Or, again, assuming that there are variations within a type, and that all individuals out-

side of the type possess relatively small and variable amounts of the same trait, the curve would be bimodal. Distributions of this kind, also, sometimes appear; but they are almost invariably the result of some extraneous factor. There is, for example, an endemic disease found among the inhabitants of the valleys of Switzerland and Savoy known as cretinism, which results in feeble-mindedness. If the intelligence test were given to all the inhabitants of these regions, we should doubtless find a disproportionate number of feeble-minded individuals, which would result in a bimodal distribution in the total population. It appears from the investigations thus far made that all individuals possess all innate traits, but in varying degree. Some individuals have any one in relatively large measure; others, in relatively small measure; and between the two extremes there are individuals who possess it in intermediate degree, the whole distribution forming a continuous curve. From this point of view, we may, for practical purposes, employ the term 'type' to mean those individuals who fall in any arbitrarily selected part of this curve.

41. Variation: Relation of traits to each other. A second sub-problem of variation concerns the relation between the scores found by different tests of the same individual or group of individuals. To put it in another way, the problem is to discover the tendency of one trait to vary directly, inversely, or independ-

ently, with another. It may be, for example, that a single individual has a high score in both of a pair of tests; or that he has a high score in the one, and a low score in the other test. The statistical device by means of which a relation of this kind is measured, is called the method of correlation. The application of this method results in a value called "the coefficient of correlation," which indicates the probability of the tendency of covariation of two traits. Suppose, for instance, that in a college community, we should wish to determine the nature of the relation between success in mathematics and success in languages. We should probably find that some individuals are equally successful in both; that others are highly efficient in the first and of only average ability in the second; and that still others are poor in the first, and excellent in the second. We could, in such a case, by means of some one of the correlation formulas, obtain a coefficient which would represent the probable degree of relationship between the two traits. If the coefficient is positive and has a value of +1 ($r = 1.00$), the two traits tend to vary directly; if the coefficient is negative and the value is −1 ($r = -1.00$), the two traits tend to vary inversely; if the coefficient is zero ($r = 0$), the two traits tend to vary independently. These positive and negative limits are rarely reached; the coefficient usually appears in fractional form, expressed as a decimal with its proper sign.

The question now arises as to the significance of the

various correlation coefficients. What, for instance, does a high positive correlation between two traits mean? It may mean not only that the two traits are closely related, but also that the single scores which are correlated are two measures of one and the same trait. Such an assumption can, of course, be made only when the correlation holds for a large number of individuals, when the tests themselves are so refined that no extraneous factors are involved, and when some logical connection or sufficient reason may be found for regarding the two traits as one. Let us take, for example, the correlations of the various tests which are combined in the general test of intelligence. It is usually supposed that intelligence is a trait which has many aspects. The general test for intelligence is, therefore, made up of a number of single tests which do not ordinarily show high positive correlations with each other. It is argued, however, by C. Spearman, on the basis of a mathematical treatment of the results, that intelligence is constituted of a 'general factor' or 'general ability,' which is the basis of all cognitive performances. This view is, however, not yet generally accepted. For us it serves as an illustration of the kind of argument which is based on the positive correlations of traits. On the negative side, Thorndike holds that the correlation method has disproved many common-sense relations supposed to exist between traits. Some of these are "that superiority to the central tendency in vividness and fidelity

of imagery of one sort, implies inferiority to the central tendency in vividness and fidelity of imagery of other sorts; that superior ability to get impressions through one sense is related to inferiority in getting impressions through other senses; that intensity of attention varies amongst individuals in opposition to breadth of attention, so that a high degree of power to attend to one thing at a time goes with a low degree of power to attend to many things at once; that the quick learner is the poor rememberer; that the man of great artistic gifts, as in music, painting, or literary creativeness, is weak in scientific ability or matter-of-fact wisdom; that divergence above the mode in power of abstract thought goes with divergence below the mode in thought about concrete things; that the man of superior intellect is likely to be of inferior mental health; that the rapid worker is inaccurate; that an agile mind goes with a clumsy body; . . ."[1]

42. Variation: Personality. A third sub-problem, that of intravariation, concerns the possibility of collecting the ratings of all traits found in a single individual, and of presenting them in such fashion as to give a picture, a psychogram as it is sometimes called, of the relative strength of all the traits in that individual. The result would then be a picture of the individual's personality or individuality. Just as a

[1] E. L. Thorndike, *Educational Psychology*, iii, 1914, 360.

teacher may take a pupil's grade in spelling, in reading, in arithmetic, or in geography, and take their average as a measure of his 'scholarship', so the differential psychologist would like to take the scores of all the traits of a single individual and somehow average them as a measure of his individuality or personality. This is the problem, but as stated it probably will never be solved; for one thing, there are too many traits; for another, the traits themselves are so heterogeneous that they cannot be measured by the same scale. Besides, what is desired is a psychogram that will be useful to the biographer, the historian, the physician, the social worker, the teacher, the employer. The kind of picture that this would be can be determined only from the attempts that are being made to produce it.

At present the definitions do not agree; there is not even agreement in regard to terms. Stern would, in this context, employ the term 'individuality' and he would reserve 'personality' for certain philosophical interpretations of the individual. Most psychologists, on the other hand, use 'personality'—and some of them 'character'—for Stern's 'individuality.' Even when the same thing is meant there is as yet no consensus of opinion as regards formal definition. What differential psychologists are trying to do is to find a small group of traits, every one of which may be measured and the sum or integration of which, for practical purposes, will serve as a picture

of the personality. It is generally agreed that one of these traits should be intellectual ability or intelligence; it is also admitted that temperament should be another, although there is still a question as to what the temperament shall be. Many psychologists think that a third trait of personality should be something like 'activity', or whatever it is that distinguishes the individual as more or less aggressive, alert, active, and the like. A complete psychogram will require the addition of still other traits, and their selection will depend in part upon the purpose for which the psychogram is needed. For, the concept of the personality is, after all, relative; the social worker wants a picture that will show the way in which the individual will adjust himself to his social environment. The psychiatrist wants to know the personality that will help him to understand his patient's disorder, the historian or biographer must know the measure of special talent or talents which in part underlie the success of the personality in which he is interested. Perhaps the picture should be so complete that any one of these investigators could find in it the measure of the traits which for him are significant. From the psychogram of a Robert Browning, for example, the biographer would select the threefold measure of his artistic talents, the social worker the measure of his moral character, the psychiatrist that of his temperament. All would doubtless be interested, although in different degree, in measures of his intelligence.

This, then, is the practical problem; many hands are at work upon its solution, various traits and tests for measuring them are under investigation. Ultimately no doubt personality will be measured, and when this is done a fourth sub-problem of variation will emerge, namely, the correlation, the 'comparison' as Stern calls it, of two or more personalities, the problem of total-variation.

43. The conditions of variation. The conditions of variation are, of course, complex. Some of them, those that consist in the structure, the development and organization of the individual, cannot be measured. Variations of intelligence may result in part from arrested development of the brain and this condition is not measurable. Others, like the influence of education, of the social and the physical environments, of sex, of age, of heredity, of malnutrition, may be determined quantitatively.

The investigation of these and similar conditions consists primarily in comparing the distributions which occur under two sets of conditions. If, for instance, we desire to know the effect of differences in sex, we give the same test to an equal number of each sex—care being taken that other conditions, such as social status, age, race, etc., do not enter—and then compare the resulting distributions. The comparison may be made in either of two ways: in the one, the curves of each distribution may be plotted

and the comparison made by direct inspection; in the other, coefficients of correlation between each sex and the total distribution may be determined, and the coefficients compared. The effect of any other set of conditions may be investigated in the same way.

44. Physical expressions of traits. The final problem, one of some practical importance, seeks to discover in the individual some physical mark or characteristic behavior that shall serve as a sign or indication of the degree in which the individual possesses some particular trait. It is popularly believed that relative intelligence is indicated by some such character as the size of the head, the height of the brow, the distance between the eyes, the brightness of the eye, or the ensemble of all of these. It is also thought that the characteristic temperament of the individual may be indicated by bodily posture and facial expression; the melancholic droops, the sanguine raises himself up. It is a problem of differential psychology to examine these and other similar suggestions, and if a correlation be found, to classify and explain them. The method of examination consists in correlating the physical measurement of the expression with the psychological measurement of the trait. In general, it has been found that traits of an affective or volitional kind are more readily indicated by bodily characteristics than are intellectual traits; and investigations at the present time are restricted, for the

most part, to this aspect of the problem. The ratio of height to weight, measures of handwriting, and the like, as indices of temperament, give promise of success; but whether a particular trait finds an unequivocal expression in any physical character, has not yet been determined.

45. Individual differences and general psychology. Thus far, in our discussion of individual differences, we have been in the atmosphere of technology. The 'individual' has been a common-sense individual, one that has abilities, capacities, and accomplishments. Furthermore, the tests employed for the measurement of these capacities are experiments of a technological kind, and the results have been considered with regard to their usefulness. Behind the whole conception of individual differences there has, however, been a psychological theory and, as a result of our investigation of individual differences, it appears that the theory of mind in use as set forth in the consciousness psychologies, and also the psychological theory advocated by behaviorism, are inadequate to the problem of individual differences as it is at present in process of solution. There are, of course, individual differences among the phenomena of consciousness, and there are also individual differences in the behavior of organisms; but judging by the experiments as we find them, a theory of conduct requires more than either of these can furnish in itself. It would seem, therefore,

that a theory adequate to the technology of individual differences is to be found only in some such conception of the individual as that of a psychophysical organism, a mind-body (see p. 35 ff.). We have, however, still to ask whether differences are also to be found among individuals when the latter are defined in the sense of critical science.

Since in existential psychology the individual is defined as a nervous system, and since nervous systems are distributive, the experience which is regarded as logically dependent upon these nervous systems must also be distributive. A psychology of this kind has, however, little interest in individual differences; its problem is to describe mind in general and it seeks, therefore, for uniformities rather than differences; furthermore, its attitude precludes the study of values which is the principal object of the study of individual differences. For these reasons, few investigations in this field have been made. Nevertheless, there is evidence that experience from the point of view of existential psychology is also distributive. Some individuals, for instance, are totally color-blind; others are partially color-blind; still others are color-weak; and, although it was formerly thought that these individuals fall into 'types' in the old sense of that term, it now appears that they form a continuous series. Individual differences have also been noted in audition, taste, and smell, in the mode and intensity of imagery, in the degree and duration of attention,

and in the qualitative make-up and intensity of ideational patterns. All these differences are, however, of significance only in so far as they may be of assistance in the logic of experimentation and systematization.

Supplementary Readings for Chapter V

Paragraph

37. W. Stern, *Die differentielle Psychologie in ihren methodischen Grundlagen*, 1911, 1 ff.; E. L. Thorndike, "Individual Differences and Their Causes," in *Educational Psychology*, iii, 1914, 142 ff.; *Educational Psychology (Briefer Course)*, 1916, 231 ff.; E. Meumann, *Vorlesungen zur Einfuhrung in die experimentelle Pädagogik*, ii, 1913, 1–93.

38–39. W. Stern, *op. cit.*, 19; E. L. Thorndike, *op. cit.*, ii, 1913, 16 ff., 195 ff.; D. Starch, *Educational Psychology*, 1919, 10; J. B. Watson, *Psychology from the Standpoint of a Behaviorist*, 1919, 231 ff.

40. R. S. Woodworth, *Psychology, A Study of Mental Life*, 1921, 274 f., 279 ff.; E. L. Thorndike, *op. cit.*, 152 ff., 315 ff.; S. L. and L. C. Pressey, *Introduction to the Use of Standard Tests*, 1923, 181; D. Starch, *op. cit.*, 26 ff.; C. S. Yoakum and R. M. Yerkes, *Army Mental Tests*, 1920; J. Peterson, *Early Conceptions and Tests of Intelligence*, 1925.

41. E. L. Thorndike, *op. cit.*, 347 ff.; D. Starch, *op. cit.*, 49 ff.

42. C. R. Griffith, *General Introduction to Psychology*, 1923, 371 ff.; J. B. Watson, *op. cit.*, 392 ff.; J. E. Downey, *The Will-Temperament and Its Testing*, 1923; H. L. Hollingworth, *Judging Human Character*, 1922; C. E. Seashore, *The Psychology of Musical Talent*, 1919; L. M. Terman, *The Measurement of Intelligence*, 1916.

43. E. L. Thorndike, *op. cit.*, 169 ff., 206 ff., 225 ff., 270 ff., 281 ff.; D. Starch, *op. cit.*, 65 ff., 73 ff.; R. S. Woodworth, "Racial Differences in Mental Traits," in *Science*, N. S., xxxi, 171 ff.; H. B. Thompson, *The Mental Traits of Sex*, 1903; G. M. Whipple, *Manual of Mental and Physical Tests*, 1914–15.

44. C. R. Griffith, *op. cit.*, 358, 360, 362 f.; P. Mantegazza, *Physiognomy and Expression*, 1889; Th. Piderit, *Mimik und Physiognomik*, 1919; J. E. Downey, *Graphology and the Psychology of Handwriting*, 1919.

CHAPTER VI

THE PSYCHOLOGY OF THE ABNORMAL

There is never anything absolute in a classification; diseases like living beings form a continuous series in which we establish divisions according to our needs. Every classification answers to certain practical ends.—PIERRE JANET.

46. The concept of the abnormal. In passing from the study of individual differences to the psychology of the abnormal, we exchange the 'individual' for either the personality or for certain modes of experience. Many kinds of psychological experience and many peculiarities of personalities, from whatever point of view they are regarded, may conveniently be called 'abnormal'. But the concept itself is not easy to define. If we take refuge in the derivation of the word and say that the abnormal is, of course, a deviation from the normal, we only exchange one difficulty for another; for normal experience is no easier to define. By the latter term we generally mean that which is customary or usual, and by the abnormal that which is not customary, the not-usual; and it is in this general sense that we must try to define more accurately the two terms. Both arise from the fact that experience is variable, and one is, therefore, inclined to say that the normal is that which occurs most frequently. We

cannot, however, employ frequency as a criterion in the sense of the central tendency, *i. e.*, the average, median, or mode, because this is a point; and that which is customary or usual is not a point. We mean, rather, a range of points on a scale within which variations may occur. From this point of view, assuming that the curve of distribution approximates the ideal curve (see p. 94), the normal would include that part of the curve that represents the greatest frequencies, and on each side of this range the abnormal, representing the lesser frequencies, would fall into two groups, the subnormal and the supernormal. There are, however, several difficulties in the way of defining the normal in terms of frequency. Stern, for instance, suggests that the most frequent occurrence is at times the abnormal, as for example, during financial panics, the Children's Crusade, or the Tulip Craze. Since phenomena like these occur only rarely, we must modify the frequency criterion by saying that the normal is that experience which most of the time occurs most frequently. There is, however, a more serious objection. What are the limits of normality? How wide may the range of variability be within which all individuals may be regarded as normal? These limits may be determined in three ways. We may arbitrarily define the normal in statistical terms. We may say that 50 per cent of the cases which group themselves symmetrically about the central tendency shall constitute the nor-

mal. Since, in this case, there is no other than an arbitrary or statistical reason for selecting 50 per cent rather than some other frequency, it may be that the group thus defined as normal would contain individuals that by another criterion would be considered as abnormal. This risk would have to be taken. We may, again, set the limits by a social or some other teleological requirement; the normal individual is, we may say, one that successfully adapts itself to its environment, and the abnormal is one that does not. This criterion is, in fact, often employed; but it also is not entirely satisfactory. We should have to say in such a case that the supernormal individuals are included among the normal individuals, and consider only the subnormal as abnormal; or else we should have to find still another way to distinguish the normal from the supernormal. We might, for example, say that the supernormal individuality, in addition to adapting itself adequately to its environment, is also creative, or has in large measure some especial gift or talent. Both of these devices are sometimes employed. A third possibility, and one that applies both to experiences or abilities themselves and also to individualities, is, in the former case, to fall back upon the nervous system or, in the latter case, upon the physiological individual, calling normal experience that correlated with the normal nervous system, and the normal individuality the one correlated with the normal physiological organism. It

does not help, however, to refer the problem either to general biology or to pathology or to medicine. The first rarely employs the terms normal and abnormal, and then only in a general and not in a specific sense; in pathology, health and disease are taken for granted; in medicine where 'norms' are frequently employed, as *e. g.*, of bodily temperature, pulse rate, breathing, they are purely diagnostic and are themselves variable.

Our search for definitions of 'normal' and 'abnormal' that shall accurately characterize the phenomena to which they refer has proved to be a failure. We have seen that these terms are, in fact, employed in several different ways; and later we shall see that they vary in meaning with their subject matter, or with the point of view from which the subject matter is regarded, *i. e.*, the norm of intelligence is defined statistically and that of sanity from a social point of view.

47. Phenomena regarded as abnormal. We have now to find out what psychological phenomena are considered as abnormal and to see where our problems lie. Since there is no adequate definition of the abnormal to help us, we must have recourse to enumeration. A mere list or catalogue of abnormal mental or psychophysical occurrences would, however, not always be of value. There are, it is true, abnormalities of sensation and behavior which are, as it were, independent variations from the normal, and these may be listed; but many psychological abnor-

malities are interrelated, and are connected with an abnormal consciousness of 'self', and these should be studied as wholes. We shall need, therefore, in addition to abnormal experiences and traits of the former kind which may be listed, schematic outlines or pictures of abnormal types which must be regarded in their unitary character. These schematic outlines we shall have to obtain from the classifications of abnormal phenomena as we find them in books. Unfortunately, these classifications are made from different points of view, and they frequently change according to the particular theory that happens to be in vogue. Most of them are made by social workers, educators, and physicians, for diagnostic purposes, and consequently they include many details which we may ignore. It shall be our aim to find the particular characteristics of every type, which will permit our problems to emerge in bold relief. We must, therefore, be on our guard against assuming that the various types, as we shall picture them, are as simple or as clearly differentiated as they will appear. We may roughly divide the abnormalities with which we shall be concerned, into three groups: the deficient and exceptional types, the temporary abnormalities, and the permanent disorders.

48. The deficient and exceptional abnormalities. This group comprises those individuals who are deficient because they lack one or more modes of

sensory experience (as the blind or the deaf) and also those that are functionally either deficient or superior to the normal, as, for example, the feeble-minded and the genius. The blind and the deaf, when the defect is congenital, are of interest to psychology because their perceptual world is unique. The functional group is of special interest to education, medicine, and sociology, although they also offer many problems to psychology. The first of these problems is a matter of classification. How are the feeble-minded and the genius to be distinguished from the normal individual, and how may the feeble-minded as a group be further divided? The earlier attempts at classification of the feeble-minded were made in terms of social standards, of their ability to adapt themselves to their environment. The criterion, for example, adopted by the English Royal Commission on Mental Deficiency is given by Terman as follows: "A feeble-minded person is one who is incapable, because of mental defect existing from birth or from an early age, (a) of competing on equal terms with his normal fellows; or (b) of managing himself or his affairs with ordinary prudence." Medical classifications are, on the other hand, made according to physical and physiological defects.

Definitions like these, while adequate to their purpose, cannot serve the educator, and he has substituted a characterization based upon intelligence tests. The unit employed is called 'the intelligence quotient' (I. Q.). This value is the ratio of the mental

age of a child to its chronological age; the mental age is measured by tests which are graded according to chronological ages. If, therefore, a child of six years of age obtains a satisfactory score in the test devised for his age, he has an I. Q. of 100. If, on the other hand, a child of six years of age can obtain a satisfactory score only in the test devised for a child of five years of age, he has an I. Q. of 83. The feeble-minded is arbitrarily defined as an individual who has an I. Q. of 70 or below, and this group is subdivided into three classes: the moron, whose I. Q. varies between 50 and 70; the imbecile, between 20 or 25 and 50; and the idiot, below 20 or 25. "According to this classification," writes Terman, "the adult idiot would range up to about 3-year intelligence as the limit, and the adult imbecile would have a mental level between 3 and 7 years, and the adult moron would range from about 7-year to 11-year intelligence."[1] It will be observed that this mode of classification implies 'intelligence' as a variable trait, a low degree of which serves to distinguish the feeble-minded, and, secondly, it suggests that the intelligence of the feeble-minded results from arrested development. Two problems, therefore, emerge: the nature of intelligence, which we have already discussed, and the meaning of mental development, which we shall later investigate. The feeble-minded, of course, may be characterized in

[1] L. M. Terman, *The Measurement of Intelligence*, 1916, 80 ff.

terms of other traits than those of intelligence. As a group they show emotional instability, a lack of motor control, an inability to maintain attention for long intervals, and they are highly suggestible. Since these traits are variable, however, we may expect to find them, like intelligence, distributed through the three classes of feeble-mindedness.

The superior individual offers unique and difficult problems but, unfortunately, little is known about him. In terms of the intelligence quotient he is sometimes divided into two groups: the first by quotients ranging from 110 to 120, and the second ranging from 120 to 140. Whether, however, he possesses some trait in high measure over and above a superior degree of intelligence, is a question which cannot now be definitely answered.

49. The temporary abnormalities. The second group, which we have called the temporary abnormalities, includes such forms of conduct as dreams, hypnosis, neurotic abnormalities (commonly called the 'neuroses'), illusions, hallucinations, and memory defects. All of these may be regarded as abnormalities which are more or less temporary and occur in greater or less degree in most normal individuals.

The dream, a product of natural sleep, is abnormal only in the rapid succession of bizarre ideas, in the uncritical attitude of the dreamer (who generally accepts without question the events of the dream),

and in an almost total inhibition of movement. Occasionally, it is true, the dreamer talks and, more rarely, walks in his sleep, but these are exceptions to the general rule. Another state in some ways similar to the dream is the somnambulism. It is a characteristic stage in hypnosis and occurs also in certain forms of hysteria. Hypnosis is an artificial sleep in which the individual may be described as being half asleep and half awake. It is induced by suggestion; the suggestion may come from the individual himself, as in crystal gazing, or it may derive from another individual whom we call the hypnotizer. In the latter case the subject must without reservation accept and carry out the commands of the hypnotizer; in some cases this acceptance may be voluntary, and in others it may derive from the belief that the hypnotizer has a peculiar power. Although the phenomena of hypnosis are variable they may be divided roughly into three stages: the first is a kind of lethargy, a drowsiness in which the subject is vaguely aware of himself and of his surroundings, and vividly aware of the commands of the hypnotizer. The second stage is called light hypnosis or catalepsy; the subject is partially anæsthetic—he is unable to feel, hear, or see anything that is not suggested by the hypnotizer, he is also motionless except in so far as he performs actions at the commands of the hypnotizer and when he awakes he has a partial amnesia (a cloudy memory of what happened during the hypnotic state). The

third stage, that of deep hypnosis, is characterized by somnambulism; all of the phenomena of the second stage occur here in an exaggerated form, the subject is totally unaware of himself and of his environment, and when he awakes he has a total amnesia. Hypnosis has its prototypes in normal experience. Whenever we do implicitly what we are told to do, whenever we become so completely absorbed in a book, a play, an argument, an event, that we "forget time and space", we have assumed the attitude and something of the mental state of the person who is hypnotized; the anæsthesia of the child whose attention is distracted from its hurt, and the amnesia that occurs after the dream of normal sleep, are in kind like the anæsthesia and the amnesia of hypnosis.

The neurotic abnormalities include a group of phenomena which are connected with the individual's consciousness of his 'self' and which, until recently, the medical classifications have correlated with nervous dispositions. At present, there is a tendency to regard them as merely psychological, and the classifications are so unstable that they have ceased to be useful. One type of the neuroses is distinguished by abnormal anxieties, worries, obsessions, and fears. Another type, sometimes called hysteria, is extraordinarily complex. Its characteristic state is a somnambulism which, unlike the artificial sleep of hypnosis, is spontaneous; the individual becomes completely absorbed in a group of ideas which center upon some

former highly emotional experience, and which find expression in curious motor phenomena. As regards the latter, the subject may make a continuous series of rhythmical movements, or of spasmodic contractions or twitches, or, again, he may show a partial or total paralysis which disappears during normal sleep or when the individual awakens from the somnambulism. On the mental side, hysteria is characterized by amnesia, emotional instability, and at times by an alternation of personality. It frequently happens that, if an individual who has an amnesia of this kind is hypnotized, he is, in the hypnotic state, able to give an account of what transpired during the hysterical somnambulism. Closely allied to the hysterical somnambulism is the trance of the spiritistic medium. Although hysteria rarely if ever occurs in normal individuals, many of its phenomena, like those of hypnosis, are found in normal experience. Whenever we become obsessed with love or hate, whenever we brood long over an injury or a sorrow, and under the influence of the love or hate, the injury or sorrow, do things that are unreasoned, that are compelling, and that otherwise we would not do, we simulate the somnambulism of hysteria.

Illusions, in so far as they are abnormal, consist in ascribing an unusual meaning to perceptions because their context is unusual; and hallucinations are ideas which by virtue of an abnormal degree of vividness and intensity, and a failure of normal cues, are mis-

taken for perceptual objects. Both are of interest for the psychology of meaning and both, as we shall see, play an important part as symptoms in the more complex abnormal states. Apart from the amnesia of hypnosis and hysteria, there are memory defects which follow upon some injury to the brain. Such, for example, as the aphasias in which the individual does not recognize spoken or written words, or is unable to speak or write; or again, as the retroactive amnesias in which the patient loses the memories of all events that occurred during an interval of time immediately before an injury to the brain.

50. The permanent disorders. The permanent disorders include what, for some years, have been called the insanities and have been considered as incurable. They comprise, first, what Kräpelin has called 'manic-depressive insanity' which appears in three forms: depression, mania, and a circular form which is an alternation of the two. As the names indicate, the most prominent symptom is strong and long-continued emotion. In the depressive phase, the facial expression, bodily posture, and movements, are expressive of sadness and melancholy. The patient frequently blames himself for something done or not done, and this self-censure occupies all his thought. Ideas come slowly, articulation is deliberate, and the voice is low. In the excitatory phase, all is reversed. The eye is bright, facial expression is animate, move-

ments are quick and vigorous; the patient is carried away with exalted ideas of his power, his ability, his wealth. Ideas come in torrents and with loud and rapid speech. In the acute forms of the disease, all these symptoms are aggravated—movements are violent and incessant, speech is incoherent, and ultimately this phase ends in exhaustion.

The permanent disorders include, secondly, a disease known as 'dementia præcox' because it was formerly, though wrongly, considered as a disease characteristic only of adolescence. It has several well-developed clinical forms, each of which is marked by a special group of symptoms. On the mental side, the most important of these are systematic delusions or mistaken beliefs. Delusions, of course, occur in normal life, but in these disorders they become the background of all the individual's thinking. In meaning content, delusions are either persecutory—the patient believes that he is being persecuted by some individual or group of individuals or by the whole world; or else they are expansive—the patient believing that he has great wealth or power or distinction. On the side of behavior, dementia præcox is marked by impulsive acts, stereotyped movements and mannerisms, and, particularly in one form of the disease, by motor inhibitions.

A third principal form of the permanent disorders is called paresis, or general paralysis of the insane. It is a disease which normally begins not earlier than

middle life, and it is definitely correlated with disease of the nervous tissues. It has various forms, some of which are characterized by excitement and grandiose delusions; others by depression and persecutory delusions. It has also a course which may be arbitrarily divided into stages, but in general it is marked by a progressive mental deterioration. All normal habits, ideals, and ambitions are gradually lost. Intelligence, also, deteriorates, and at the end, if the disease runs its course, the individual becomes incapable of any activity and lives a merely vegetative existence.

The foregoing must serve as an account of the kind of phenomena which are called 'abnormal.' It will be observed that some of them are abnormal only because they are not customary; that others are types which are arbitrarily called 'abnormal'; that still others are abnormal because they are connected with abnormalities of the pathological kind. It will be noticed, also, that definitions of the abnormal vary, as we said in the beginning, according to the point of view from which they are regarded. The phenomena themselves are extremely variable, and the problems which they present to psychology are no less variable. The latter, however, depend in part upon our attitude toward the disorders themselves; it is our task to consider them not as symptoms of disease but as abnormalities to be described and brought into relation with the phenomena of normal life. One way in which this may be done we shall discover in the next chapter.

Supplementary Readings for Chapter VI

Paragraph

46. W. Stern, *Die Differentielle Psychologie*, 1911, 155 ff.; H. W. Gruhle, Psychologie des Abnormen, in *Handbuch der Vergleichenden Psychologie*, ed. by G. Kafka, iii, 1922, 3 ff.; J. Schaxel, *Grundzüge der Theorienbildung in der Biologie*, 1922, 136 ff.

47–48. A. Binet and Th. Simon, *The Intelligence of the Feeble-Minded*, transl. by E. S. Kite, 1916; W. Stern, *The Psychological Methods of Testing Intelligence*, transl. by G. M. Whipple, 1914; H. H. Goddard, *Feeble-Mindedness, its Causes and Consequences*, 1914; L. W. Terman, *The Measurement of Intelligence*, 1916.

49. For Dreams, see E. S. Conklin, *Principles of Abnormal Psychology*, 1927, 329 ff.; H. Ellis, *The World of Dreams*, 1911; Wm. McDougall, *Outline of Abnormal Psychology*, 1926, 137 ff.; E. B. Titchener, *A Beginner's Psychology*, 1915, 325.

For Hypnosis, see E. S. Conklin, *op. cit.*, 234 ff.; Wm. McDougall, *op. cit.*, 81 ff.; E. B. Titchener, *op. cit.*, 341.

For Hysteria, see P. Janet, *Major Symptoms of Hysteria*, 1907; *The Mental State of Hystericals*, transl. by C. R. Corson, 1901; E. S. Conklin, *op. cit.*, 130 ff.

50. E. S. Conklin, *op. cit.*, 78 ff.; E. Kräpelin, *Clinical Psychiatry*, transl. by A. R. Diefendorf, 1904; *General Paresis*, transl. by J. W. Moore, 1913; J. W. Bridges, *An Outline of Abnormal Psychology*, 1921; W. A. White, *Outlines of Psychiatry*, 1913; G. Störring, *Mental Pathology in its Relation to Abnormal Psychology*, transl. by T. Loveday, 1907.

CHAPTER VII

ABNORMAL EXPERIENCE AND MEANINGS

We are selves, and our life is a unity, but let us beware of laying too great emphasis on the degree of that unity; let us remember that in many cases it is less than we are accustomed to suppose.—JOHN LAIRD.

51. Normal and abnormal experience. There can be no doubt that the wisest mode of attack in our study of the psychology of the abnormal is to bring the various anomalies into relation to the facts and laws of normal experience. This follows from the logic of individual differences. It is, furthermore, a method which existential psychology consistently employs, and one which empirical psychology and medical technology frequently forsake. In some cases the abnormalities of experience immediately fall into line with known facts; in others much work is needed before it can definitely be shown in what way the anomaly is a variation of normal experience; and in still others the exact relation is not easy to see because the similar normal experiences are themselves not understood. In the last case it may happen that a study of the abnormal throws some light upon the normal experience. Illustrations of these summary statements are easily found. The lack of any mode of

sensory experience appears at once as a reduction of normal experience, but it took many careful experiments to show that total and partial color-blindness are also reductions of normal experience. Abnormalities of perception, such as the appearance of objects as unusually small or extraordinarily large in size (micropsia, macropsia), are undoubtedly related to similar experiences in normal perception which still await solution; and the two sets of problems, taken together, are profitably in course of study. Certain abnormalities of behavior, *i. e.*, the sudden loss of ability to speak or to write (as in the aphasias), the total or partial paralysis of apoplexy, the eccentric movements of locomotor ataxia, the sudden change in habits of the paretic, the apathetic behavior of the idiot, have also gradually been correlated with definite localized disorders in the nervous system and thus brought into relation to normal behavior.

52. Meaning in normal and abnormal experience. There are many disorders, however, that are puzzling because they involve the total psychophysical organism; and traits of so many different kinds—sensory experiences, innate dispositions, acquired habits and abilities, gross functions like attention, memory, and thought—are so interconnected and interwoven that it is difficult to bring disorders which involve them into relation with the normal experience of the individual. What is needed is a guiding thread which

will lead through the tangle and thus help to disentangle it. Such a clue is, we think, to be found in 'meaning.' Meaning may itself be approached from the empirical point of view as the significance, the interpretation, the value put upon or the response to, experience; from the existential point of view as the sensory experience which carries the meaning; from the biological point of view as the neural process correlated with the meaning. In their empirical aspect meanings are frequently based upon past experience, they require memories and intelligence, and they are of different types, some of which are of a lower order than others. For instance: an infant, apparently, first knows objects only as familiar; an idiot can designate objects by pointing to them but he cannot name them; we are often aware of the 'kind of thing' an object is but we know no more about it. The meaning of concrete objects and relations is much simpler than that of abstract ideas or relations. Finally, there are normal and abnormal meanings; the former are the kind that are customarily put upon experience, they may differ in type but they have a reasonable or logical relation to the object or situation. Abnormal meanings, on the other hand, are unusual; some, at least to other individuals, seem illogical. Or an individual loses an accustomed meaning, and he is left either with no meaning at all or with one of another type. Or again, he develops a system of abnormal meanings that furnishes a back-

ground for his total behavior. We turn, then, to a study of these meanings.

53. Unusual meanings. We often wonder how an individual who lacks some mode of experience, as for example a blind person, is able to do things which we who have sight think we could not do. The blind person is sometimes credited with a 'sixth sense' by means of which he is able to orient himself, to know when he is approaching large objects, and the like. The blind person has no sixth sense, however; all he does is to substitute touch, sound, and smell, for sight; he puts meaning on these qualities of experience where the seeing individual finds it unnecessary. Helen Keller, for instance, who from the age of three years has been both blind and deaf, writes: "Through the sense of touch I know the faces of friends, the illimitable variety of straight and curved lines, all surfaces, the exuberance of the soil, the delicate shapes of flowers, the noble forms of trees and the range of mighty winds. . . . I derive much knowledge of everyday matter from the jars and jolts which are to be felt everywhere in the house . . . one day in the dining room of a hotel a tactual dissonance attracted my attention. I sat still and listened with my feet. I found that two waiters were walking back and forth, but not with the same gait. A band was playing and I could feel the music-waves along the floor. . . . Smell gives me more idea than touch or taste, of the

manner in which sight and hearing probably discharge their functions. . . . Since I smell a tree at a distance, it is comprehensible to me that a person sees it without touching it. . . . By themselves, odors suggest nothing. I must learn by association to judge from them of distance, of place, and of the actions or the surroundings which are the usual occasions for them just as I am told people judge from color, light and sound ".[1] In such cases there is no increase in sensitivity, the abnormal individual is no better able to discriminate small differences of quality or intensity than the normal individual of equal practice, and he attaches no meaning which the normal individual could not also attach to the same qualities, if necessary.

We pass from instances in which novel meanings are put upon processes, as normally happens, of course, in all learning, to those in which familiar meanings are lost. It sometimes happens that as a result of injury to the brain, the individual is no longer able to localize sense impressions. He may, for example, have the experience of a pressure or a pain, but he is unable to say where the pressure or pain is felt; in other instances he can no longer orient himself, he loses all sense of direction, or he cannot distinguish his right from his left hand. The most frequent occurrences of this type are, however, those which are called the

[1] H. Keller, *The World I Live In*, 1914, 43 ff., 71 f.

aphasias. The older classifications of the aphasias divided them into two groups, motor and sensory, each of which was again subdivided according as the motor anomaly is a loss of ability to speak (verbal-motor) or to write (agraphia), and according as the sensory defect is a loss of understanding of spoken words (word-deafness) or written words (word-blindness). Of recent years, as the result of more careful diagnosis and more cautious interpretation, it appears that these older forms rarely appear singly, that motor and sensory defects occur together, and that the characteristic defect on the sensory side is neither a deafness nor blindness; it is instead a loss of meaning. In some cases the patient sees the objects presented to him but has lost only the name. Head, for example, says, "One of my patients was unable to name a series of colors placed before him, and could not choose them correctly to oral or printed commands. But, if instead of the names, he was allowed to call black 'what you do for the dead', red 'what the staff wear', with similar descriptive phrases for each of the other colors, he named them all correctly."[2] Here there is a substitution of a more specific type of meaning for one characterized in terms of "descriptive phrases." In other instances, all meaning of sound heard or printed word seen fails. In still others, the meaning of individual words is retained, but the mean-

[2] H. Head, "Aphasia: An Historical Review," in *Brain*, xliii, 1920, 390 ff.

ing of connections of words in phrases and sentences is lost. Finally, there are instances in which the meaning of all impressions is either lost or else it is vague and uncertain.

The occurrence in which an unusual or abnormal meaning is put upon a sensory experience is usually called an *illusion*. There are, of course, normal experiences, such as the geometrical illusions, which are called illusory only because the same experience has a different meaning when regarded from the physical point of view, *e. g.*, one line looks shorter than another but is equal in length to the other when measured by physical units. The abnormal type of illusion occurs when the context is furnished by some unusual idea, disposition or emotional state, as happens, for example, in the meanings called apparitions, ghosts, and spirits. In the insanities, the meanings of illusions are generally conditioned upon some systematic delusion, thus an individual who has a delusion of persecution may interpret the pounding noise of a steam radiator as one made by his persecutors in an attempt to injure him.

Closely related to the illusions are *hallucinations*, which are meanings placed upon processes not directly excited by an external stimulus; the individual puts upon such processes the meaning of an actually perceived object when, in fact, no such object is present. Normal adult individuals are, as a rule, able by means of secondary cues to distinguish imagery of exceptional

intensity, vividness, and 'body' (*Leibhaftigkeit*), from perceptions which they simulate, but children and abnormal adults frequently mistake them. Hallucinations are, of course, characteristic of dreams, of certain hypnotic states, of hysterical somnambulisms, and of the insanities. The nature of the meaning which occurs in hallucinations seems to depend upon the conditions. In dreams the events are in general derived either from incidents of the preceding day, or from the more remote experiences of the waking life; they often succeed each other in a bizarre and fantastic fashion, and sensory experiences and attitudes of the dreamer are frequently transferred to the persons of the dream. Nevertheless, the various events are held together by a general meaning, a topic or situation, and in some cases the succession of ideas is as orderly and determined as those of the waking consciousness. In the somnambulisms of hypnosis the nature of the meaning is furnished and the course of the hallucinatory ideas is directed by suggestion—the individual sees, hears, and feels as he is told. In hysteria the hallucination is generally a recurrence of some event of the normal life, and usually connected with an emotional shock. Finally, in the insanities the meaning of the hallucination is usually conditioned upon a delusion.

54. Meanings of the 'self'. There is, however, no one meaning or group of meanings which plays a more important part in the psychology of the ab-

normal than that of the 'self'. The concept of the self, with which we shall first be concerned is that of '*me*', of myself and not that of 'you', yourself, or of 'him', himself. The latter is the personality that we met in the last chapter; the individual who, by some trait or group of traits, mental, physical, or psychophysical, is marked as unique among other individuals. He is given a name that designates him, he has a status in the social group, he enjoys certain legal rights, and his selfhood is considered as persistent from birth until death. The former is rather an experience which is *myself*, which is apprehended as *me*, or which means *me*, or it may be a response that is *myself*, a striving that is *myself*. We must distinguish *myself* and *mine;* a feeling may be felt as mine and not at all as myself. Furthermore, although we may employ the terms 'awareness of self' or 'consciousness of self', we must avoid the meaning of 'self-consciousness' in the popular sense of 'ill-at-ease'. We must, instead, employ the phrase 'consciousness of self' as a meaning which is a part of, attached to, immediate experience. Exactly what the sensory processes are that are correlated with the meaning of 'self' has long been a matter of dispute; it has been said that all individual experience inherently refers to a self; that feeling is the basis of the self; that coenæsthesis, or general organic and kinæsthetic sensation, is the fundamental experience of the self; and that striving or effort constitutes the self. It seems,

however, to be more in accord with the facts to say that any sensory process whatever may carry the meaning, but that certain processes (organic sensations, sense feelings) most frequently mean the self. Moreover, the relation of the body to the meaning of the self is variable; in some cases the body is the self, in others the body is possessed by the self, and in still others—at least in some abnormal situations—the body is quite independent of the self. There are times, also, when the meaning of the self changes to an individuality with a name, a social status, legal rights, and a recognized continuity—I may think of myself in much the same way as I think of you, yourself. Among normal individuals there is, apparently, a wide variation as regards the frequency of occurrence of the meaning of self; at the one extreme there are individuals who, if we may trust their testimony, are rarely without the meaning of self; and at the other, there are individuals who rarely are aware of themselves. The average individual apparently lies between these two extremes, he becomes aware of himself only under exceptional circumstances, as for example, in moments of indecision, of thwarted effort, of excessive pain, and the like.

In the psychology of the abnormal there is, again, a wide variation of situations in which the meaning of self appears. In dreams the identity of the self is rarely lost; the dreamer is, however vaguely, a self-conscious spectator of the succession of events which,

as it were, pass before him. In the deeper stages of hypnosis the meaning of self disappears, and the inhibitions of the normal waking consciousness are removed. In amentia, particularly in the idiot and in the low-grade imbecile, the meaning of self apparently does not develop; in the dementias, especially in the later stages of paresis, all meanings of the self are lost; in the neuroses and in the insanities (in the earlier stages of deterioration) the 'self' is the source of all mental and many physical symptoms of the disorder.

In the delusions of the insanities the meaning of 'self', is almost invariably involved. If the dominant attitude of the individual is melancholy, the delusion may take the form of self-accusation; the individual blames himself for something he has not done or for some great sin he thinks he has committed. Or, it may be he thinks his life is utterly ruined, or that he has some mental or physical disease. Whatever form the delusion may take, the reference is always to himself. In delusions of persecution, the reference again is usually to the self; the patient believes that one or more individuals are attempting in some way to injure him, and as we have seen, his illusions and hallucinations are also meanings of the same kind. In grandiose delusions the self is once more the center around which all his ideas revolve; the patient himself has great power, *he* has great possessions, *he* is notorious. The 'self' that has the delusion of per-

secution is apparently the same as the normal self, whereas the self that has the grandiose delusions is a new 'self', but whether in this latter case the transformation is complete is a question which cannot be definitely answered—in some cases the individual who says he is Napoleon or some other great character, is firmly convinced of it, in others he is not so sure.

The realization of the part the meaning of self plays in all these delusions can, perhaps, best be reached by recalling similar temporary abnormalities of our usual lives. In times of excessive strain, or bodily fatigue, or low metabolism, we not infrequently have something like the delusions of self-accusation and persecution. We realize, however, that 'we are not ourselves', that our normal habitual selves are temporarily obscured and that with rest or restoration of health, we shall become 'ourselves again'. In insanity these delusions are permanent; they become systematized in such a way as to furnish the meanings, the interpretations, of all experience which can possibly have a reference to the self.

We have descriptions of a transformation of personality in which the change grows out of the original meaning of self. It begins with a modification of "common feeling", which results in a feeling of strangeness. This may be accompanied or followed by an uncertainty as regards one's 'self'. Some patients say that they think, feel, sense, differently, that a curious transformation has come over them;

others characterize this change by saying that they are more indifferent, they are less excitable, less easily cast down. Eventually, the new meanings become more insistent, the delusions (if they are present) become fixed and the change in self is complete. The new 'self', however, always bears certain marks of the old; delusions of jealousy have their origin in an original jealous disposition, a convict has the delusion that he is being pursued, the dogmatic individual becomes querulous.

In addition to these more or less gradual changes in the meaning of 'self', there are forms that are called 'the double-self'. The beginnings of a dissociation of this kind in the normal individual are seen when, for instance, a 'sense of duty' comes into conflict with an antagonistic 'desire for pleasure'. If the one determination with its accompanying ideas means my customary self and the other disposition means another 'self', which is also myself, there is the experience of a 'double-self'.[3] An instance of this kind is found in the origin of 'Sally', one of the selves of Miss Beauchamp, as reported by Morton Prince. In the course of time a double-self of this kind may become systematized; certain incidents, mem-

[3] The particular experience which we are now characterizing must not be confused with those figures of speech 'my other self', 'my real self', 'my better (or worse) self' and the like, which may, it is true, derive from the experience of a double-self but which do not necessarily imply it.

ories, feelings, volitions, are attached to the one, and others to the other self; and the double-self thus splits into two separate selves which, in experience, alternate in such fashion that while the one is dominant, the other is dissociated. In the limiting case the separation of the two selves is complete; when the one is dominant there is no knowledge or memory of the other, but there are certain habits and acquisitions of the psychophysical organism, such as ability to walk, to write and to read, and a general store of knowledge, etc., which are common to both selves. Between the extremes of the double-self on the one hand and the alternating selves on the other, there are all sorts of variations. For example, 'Self A' may have complete knowledge of 'Self B', but 'B' may have no knowledge of 'A'; or again, 'A' may be vividly aware of certain events and 'B' vaguely aware of the same experience, but each attach a different meaning to it.

55. Meaning of other selves. When we turn to the meaning of other selves instead of 'myself', to the abnormal individuality or personality, we face another set of conditions and contexts. The personality is, as we have seen, an object like other objects, and the meaning of it as a self is based on its behavior and the interpretation we put upon its words. The result is a self that differs in many ways from the self as experienced—others do not see us as we experience our-

selves. In the first place, the body is now a constituent part of the personality; it is almost impossible to conceive of a personality that we know in a different body. Secondly, personal habits, mannerisms, dispositions, are attributed to the 'individuality'; we think of the individuality as neat or careless in appearance, as courteous or rude, as having peculiarities of gait and speech, as generally gay and happy, or gloomy and morose. Thirdly, certain mental traits characterize the personality; we think of the individuality as having a certain culture, a characteristic intelligence, as possessing some particular talent. The personality that we familiarly know is all of these, somehow combined in a general meaning, so that any one or all of these characteristics may mean him, or her, or that individual to whom we attach a particular name. Although a personality of this kind is generally conceived as continuous from birth until death, he has in fact, several personalities according to his age. The infant, the child, the adolescent, the adult, the senescent are all different individualities. A personality may also change as a result of its environment, under unhappy living conditions or under monotonous or irritating working conditions, and the like. Furthermore, personalities often change within brief intervals of time; they show suddenly a new set of habits, new attitudes and dispositions which are quite foreign to the personality we formerly knew. It is this last kind of change that conditions the realization

of a new personality; the changes as a result of bodily growth and of environment are, in general, so slow that the meaning of a new personality does not occur. The sudden transformations in habits, in mannerisms, in mood, and mode of thought, are marks of a new personality, and the physician regards them as symptoms of a form of disorder.

It is worthy of notice, however, that although we may regard the personality as changed, the individual himself may still have the meaning of his old self; and that although we may regard the individual as irrational because we do not know his premises, the individual arguing from his delusion may be perfectly rational. The distinction between the two meanings of 'self' becomes more obvious when we consider the double or multiple personality.

The alternating 'self', viewed as it were from the outside, becomes the double personality and the observer is able by inference to find differences in personality of which the 'self' may be quite unaware. It sometimes happens, for example, that individual A, while normally awake and perhaps in conversation, reveals a second personality, B, by automatic writing or by automatic movements on a ouija board. A does not know what is written, may not be aware that he is writing; nevertheless, the result may be sensible, may indeed show a wide range of fact and considerable skill in composition. Or A may go into a trance and become apparently unconscious of his normal sur-

roundings; and while in this state he may say things of which he has no knowledge in the waking state. Secondary personalities like these may also be revealed by hypnosis. They are found in all stages of organization and, when highly developed, show traits sufficient in number to distinguish them as separate personalities. Well-attested cases are also reported in which the individual suddenly loses all memory of his past life, wanders away to some distant place, lives an apparently normal life for weeks or months, and then as suddenly regains the memory of his former life and at the same time has no memory of his intermediate life. Under hypnosis, however, the individual is generally able to give an account of the occurrences during the period for which his memory fails. Apparently, in these latter cases, it is the loss of memory (amnesia) which destroys the meaning of continuity of the self as experienced. It is worthy of note, however, that the amnesia is never total; the individual forgets only those things which have a reference to himself, he still recognizes objects, knows how to avoid dangers in a street, remembers, as a rule, how to read and write; but he forgets his name, members of his family, acquaintances, the city in which he lives, his normal occupation. There are, of course, numerous variations of these disorders; one individual may have several 'personalities', and the degree of amnesia between personalities is also variable; no two cases are exactly alike.

This must suffice to show the part that meaning plays in the psychology of the abnormal personality. We have employed these meanings in the sense of the interpretations which the individual puts upon the experience as given. It should not be forgotten, however, that the complete psychology of the abnormal as of the normal individual will require not only an account of the meanings as the individual knows them, but also a description of the sensory processes which underlie them, and of the behavior which seems to express them. In other words, the problem of meaning is threefold. From one aspect experience comes in the raw by way of eye, ear, and the other sense organs, and it comes in lumps, in patterns which must be described; from another aspect meaning appears as interpretation or value or use, and as such it must be known; from a third aspect it appears as bodily conduct, as behavior in the technical sense, which also must be investigated. Any one of these three aspects may be profitably studied alone; but in the end a complete psychology will correlate them one with the other and then we may hope the abnormal will take its place in normal experience as distributive. We have now to discuss the theories of the abnormal, and it will help us to keep this clue in our hands when we try to disentangle the theories.

Supplementary Readings for Chapter VII

Paragraph

52. M. Bentley, *The Field of Psychology*, 1925, 337 ff.; R. S. Woodworth, *Psychology: A Study of Mental Life*, 1921, 421, 483; H. C. Warren, *Human Psychology*, 1919, 323; Wm. McDougall, *Outline of Psychology*, 1923, 246 ff., 252, 302 ff.; E. B. Titchener, *A Beginner's Psychology*, 1915, 26 f., 65, 118 ff., 272.

53. H. Keller, *The Story of My Life*, 1903; M. Howe and F. H. Hall, *Laura Bridgman*, 1903; Th. Heller, "Studien zur Blinden-Psychologie," in *Philos. Studien*, xi, 1895, 226 ff., 406 ff.

H. Head, "Aphasia: An Historical Review," in *Brain*, xliii, 1920, 390 ff.; see also "Discussion on Aphasia," *op. cit.*, 412 ff.; P. Marie, "Revision de la question de l'aphasie," in *Sémaine méd.*, xxvi, 1906, 241 ff., 493 ff., 565 ff.; A. Pick, *Die grammatischen Sprachstörungen; Studien zur psychologischen Grundlegung der Aphasielehre*, i, 1913; S. I. Franz, "Studies in Re-education: The Aphasias," in *Jour. Compar. Psychol.*, iv, 1924, 349 ff.

54. K. Jaspers, *Allgemeine Psychopathologie*, 1913, 56 ff., 232, 241 ff.; H. W. Gruhle, *op. cit.*, 52 ff.; R. Hennig, "Beiträge zur Psychologie des Doppel-Ichs," in *Zeit. f. Psychol.*, xlix, 1908, 1 ff.; John Laird, *Problems of the Self*, 1917, 272 ff.; K. Oesterreich, *Die Phänomenologie des Ich in ihren Grundproblemen*, 1910, 306 ff., 379 ff., 448 ff.; W. James, *Principles of Psychology*, i, 1890, 291 ff.; E. B. Titchener, *A Beginner's Psychology*, 1915, 307 ff.; M. Prince, "Miss Beauchamp: The Theory of the Psychogenesis of Multiple Personality," in *Jour. Abnor. Psychol.*, xv, 1920–21, 67 ff.

CHAPTER VIII

THEORIES OF THE ABNORMAL

If we would know the works of God, we must consult themselves with attention and humility, without daring to add anything of ours to what they declare. A just interpretation of nature is the only sound and orthodox philosophy; whatever we add of our own, is apocryphal, and of no authority.—THOMAS REID.

56. The theories in general. There are many theories of abnormal conduct; but no one of them is adequate to the whole range of abnormal phenomena as we have reviewed it. Psychologists have for the most part not been interested in abnormal phenomena except in so far as abnormal are considered as deviations from normal experiences. The laws and, when empirically regarded, the causal explanations of normal should, as we have earlier seen, apply to and explain all abnormal conduct. There is, therefore, nothing to be gained in General Psychology by constructing a detailed theory of mental disorders. Occasionally, psychologists have been interested to show, in a schematic way, that their general theory of conduct is indeed adequate to the abnormal as to normal experience. Occasionally, also, either they have been willing to admit that certain forms of abnormal conduct could not—in the present state of

our knowledge—be brought into relation with normal forms, or else they have found in the abnormal a principle which serves also to explain certain normal conduct.

The theories with which we shall be mainly concerned are, consequently, not those derived from General Psychology, but theories developed by medical technologists. As technological theories their efficacy lies rather in the success with which they enable physicians to diagnose and treat mental disorders, than in their adequacy to all the facts or their logical formulation. Some of them, however, purport to be scientific theories and to explain the psychological phenomena not only of the abnormal, but also of the normal individual. For this reason, if for no other, we must investigate them. There is, however, another reason; they will serve to illustrate what was said in a former chapter about the nature of technological theories in general. The conceptions of mind which they employ derive from General Psychology although, it may be added, from empirical psychologies of the prescientific period. Furthermore, these theories, like all technological theories, are constructed with a practical end in view; they refer only to a class of functional disorders which cannot be explained directly by reference to lesions in the nervous system, and they seek to make these disorders intelligible for therapeutic purposes.

We shall study two types of these theories that

differ in a fundamental respect. The one, which we shall call the psychoanalytic theories, employs explanatory principles of a purely psychological kind, namely, purposive impulses which derive from one or more instincts. The other, named the psychoneurological theories, ultimately refers all explanatory concepts to a psychophysical, a mind-body, individual. In our study of these theories we shall regard only their essentials, and shall not undertake to distinguish differences which, however important they may be from the technological point of view, we may afford to ignore.

57. Psychoanalytic theories. These theories are so named because their chief method of diagnosis and cure is called Psychoanalysis. There is nothing in the technique of the method that is descriptive of the theories; but since the logical justification of the method derives from the theories, its name will serve to distinguish them. In principle these theories are all alike, although they differ from one another in detail. They conceive of impulses or ideas (the distinction is not always clearly drawn) as dynamic, as forces, as having energy by means of which ideas are combined or are repelled. Ideas (and ideas are meanings) are either in consciousness or else in the *unconscious*. The activity of ideas is revealed by consciousness and by particular groups or collections of ideas which have an affective or emotional component, and

which are called *complexes.* Complexes are antagonistic to consciousness and, as a result of this antagonism, they are in *conflict* with consciousness; they have, however, been *repressed* by consciousness and they cannot directly enter into consciousness, *i. e.*, they are forgotten. An illustration given by Hart will perhaps make this clearer:

"Let us suppose that a man has in the past done some action of which he is now ashamed, so that every time the thought of this action recurs to him it occasions painful feelings of remorse. Expressing this state of affairs in our technical language, we should say that the memory of the action forms a complex which is repugnant to the personality as a whole, and that therefore a conflict is set up between the complex and the personality. Under such circumstances the individual may endeavor to rid himself of the feelings of remorse by striving to banish the painful memories from his mind, to keep them studiously out of his thoughts, and so far as possible to ignore their existence. That is to say, he may endeavor to avoid the conflict by 'repressing' the offending complex, and shutting it out from the field of consciousness. This method of attaining peace of mind by refusing to acknowledge to ourselves the existence of unpleasant facts which would otherwise grievously disquiet us will be familiar to everybody. Much of the 'forgetting' which occurs in our lives is not the passive process of decay which it is commonly supposed to be,

but an active repression, a deliberate exclusion of the offending memory from the sphere of our consciousness."[1] Hart has previously defined personality as denoting "all the mental processes—ideas, emotions, memories, desires—which do not belong to the complex in question. That is to say, it denotes the whole of the mind with the exception of the particular complex which is under discussion at the moment." So much, then, for the general schema of the psychoanalytic theories. Their four principal features—complexes, conflicts, repressions, and the unconscious—we shall have to investigate further.

The definition of the 'complex' varies in different theories. Freud, for example, limits the term to those constellations of ideas which are emotionally toned and which exist in the unconscious; Hart, on the other hand, regards any group of ideas which have an emotional tone as a complex. It is generally agreed, however, that complexes are active forces, that the amount of energy which they possess is proportional to the strength of the emotional component, that they are antagonistic to consciousness by virtue of their affective tone, that they are generally painful or unpleasant in feeling quality, and that it is mainly because consciousness will not admit unpleasant ideas that they are repressed. Nevertheless, they are continuously struggling to get into consciousness, although

[1] B. Hart, *Psychology of Insanity*, 1916, 91.

as a rule they succeed only in part and then indirectly. Some of their energy may, by a process called 'conversion', be transferred to motor activities and thus appear as abnormal and automatic movements; or a part of their energy may give rise to other ideas which are pleasantly toned and which may, therefore, appear in consciousness. In the latter case the origin of the ideas is masked by the agreeable emotion; there are, as we shall later see, many ways in which this is effected.

The term 'repression' generally signifies the tendencies by means of which the emergence of the complex into consciousness is avoided. These tendencies show many forms and are called defensive-reactions. They comprise (1) Forgetting, by which is meant not the gradual process of decay characteristic of all memory but an active tendency which is never defined, and which seems to be loosely employed in the sense of 'putting a thing out of mind', 'not allowing one's self to consider a particular idea', and the like. (2) Avoidance of any external stimulus which might, by association, recall the complex. (3) Compensation, an attempt to find some pleasant equivalent which will take the place of the unpleasant ideas of the complex, as for example, daydreaming, appeal for sympathy, the assumption of wit to cover a sorrow, cynicism. (4) Rationalization, in which the individual justifies an action whose consequences have become a complex; we fancy even in normal life that

we assign the correct reason for an act when, as a matter of fact, it is erroneous—a politician, for instance, may justify an action as for the best interests of his constituency when his real motive is his own self-advancement. Finally (5) Sublimation, a means of avoiding a complex by giving it an outlet in literature, in art, or in some other constructive or creative work. All these are considered as ways in which the individual avoids and thus represses sorrow, inefficiency, unfulfilled wishes, remorse, and similar 'complexes'.

The conflict is the battle between consciousness, on the one hand, and the repressed complex on the other. The signs of a conflict consist in the defensive reactions which we have already discussed; in conversions or the motor responses which are objective expressions of the activity of the complex; and in distortions. The latter are activities of the complex; the complex, as if it were intelligent, changes, modifies, distorts itself in such a way as to delude consciousness. This distortion is accomplished in three characteristic ways. In the first the complex is projected into another individual; if, for instance, we have a fault we are intolerant of the same fault in other people, we are thereby able to rebuke others for it and to avoid the unpleasantness of reprimanding ourselves. In the second way the complex is masked by the assumption of an opposite character; the wolf, for example, appears in sheep's clothing, the ignorant

individual affects polysyllabic words. Finally, the complex expresses itself in moods, dispositions, unreasonable attitudes, and in other ways, which consciousness, not knowing the source, cannot explain.

The concept of the 'unconscious' is not easy to formulate in a way that would be satisfactory to all who accept this type of theory. The unconscious is sometimes characterized as a group of "repressed instinctive impulses" and certain "psychic formations" which "appear as offspring" of these impulses, the whole representing a "play of impelling and inhibitory forces". It possesses different levels, the lowest of which consists of "the material and repressed instincts, sexual activities, wish impulses, and erotic fantasies"; a second level is made up of "the repressed material that derives from repressions in later life." It is, at other times, also described as a group of emotionally toned ideas that have formerly been in consciousness but have been repressed and cannot reënter consciousness except under special circumstances. In this latter sense it is, apparently, the same as a complex, and in fact, the two terms are used synonymously by some writers. This is Freud's 'unconscious', but although Freud frequently substitutes 'ideas' for 'impulses', he generally employs the term 'unconscious' in the latter sense, viz., that of a group of impulses or forces. There are, of course, many subsidiary notions about the unconscious, but the significant features are that the impulses and ideas

are not conscious, that they are in constant conflict with the conscious personality, that they have an inherent energy, and that they have the ability to distort and otherwise change themselves—apparently with the purpose of avoiding the repressions of the conscious personality.

We are now in a position to see how the various mechanisms of this complicated structure explain the abnormalities which we have discussed in the preceding chapters. Hysteria is, in Freud's thinking, the result of a conflict between desires of a sexual kind and the conscious personality; its prototype is the dream, which is always the expression of sexual wishes. In the hallucinations of the dream the unconscious idea or wishes (the latent content of the dream) appear to the conscious personality in a fashion so distorted (the manifest content of the dream) that they are not recognized for what they are. A characteristic of hysteria is the appearance of many automatic and stereotyped movements, all of which are considered as 'conversions.' Delusions are systematized beliefs which derive from the one or the other of the defensive reactions. The delusion of persecution is an instance of projection—the conflict is assigned by the personality to another individual or a group of individuals. If, for example, a man fails in business he assigns his failure not to his own lack of ability or prudence, but to a plot against him by other persons. Grandiose delusions, on the other hand, are wish ful-

fillments, the personality, not willing to face an incapacity, avoids the complex by indulging in daydreams in which he imagines himself the kind of individual he would like to be. In the course of time the daydream becomes fixed as a delusion, and the individual is converted into another personality; he thus escapes his conflict by becoming insane.

These, then, are the principal features of the psychological type of theory designed to account for the abnormalities of the personality. The theory as a whole is reminiscent of philosophical psychology in the days before empirical psychology undertook to become a science. The ideas with which it deals are entities; they apparently combine into groups and are, as it were, cemented together by an emotion. The typical formation is, therefore, the 'unconscious' or the complex which, as we have seen, is a force, has an energy which it exerts in many ways. The nature of this energy, at times called the *libido*, generally is not discussed. It is, however, of a psychic kind which is similar to physical energy; it derives either from the sexual instinct (Freud), or from all instinct (Jung), and instances may be found in which the psychic energy is transformed into physical energy. White, for example, in an explanation of conversion says: "The complex, with its large emotional content being repressed, dissociated, falls out of association with the other facts of mental life, and so its accumulated energy finds no easy channels of exit. The complex, therefore, is

dynamogenic, and when sufficient energy has been accumulated to overcome resistance, to break down barriers, an explosion—an attack—takes place. In this attack the energy set free naturally flows along lines of least resistance. If we consider the various activities of consciousness as constituting a hierarchy, we will see that the psychomotor levels are relatively low, so that as the tendency in attacks is for the energy to seek lower rather than higher levels, these psychomotor outlets furnish the channels of least resistance."[2] This notion needs no comment; it may be said, however, that Freud does not undertake an explanation of the phenomenon of conversion.

Apart from the naiveté of its fundamental concepts, the structure of the theory has small justification in fact. We know that we very frequently do things for which we can assign no 'motive'; and, in some cases, we act contrarily to the intentions of which we are aware. We know, also, that in moments of indecision we sometimes feel an "unpleasant emotional tension", we say that "we feel torn" between two possible modes of action. We know, furthermore, that in general we prefer pleasant, or avoid unpleasant, situations. We know, finally, that we at times make excuses for ourselves, that we rationalize our conduct, that we try to forget disagreeable memories, that we sometimes find daydreaming pleasurable. By means of special methods (hypnotism,

[2] W. A. White, *Mental Mechanism*, 1911, 60 f.

psychoanalysis, analysis of dreams) memories have been found which could not be, or are not voluntarily recalled, which have an unpleasant affective tone, and whose meanings are not the same as those of the conscious personality. These are the facts upon which the structure of the theory is built.

In the beginning, repressions and complexes are purely descriptive terms, and the 'defensive-reactions' are merely classificatory. The only evidence in observed fact for the conflict is the occasional indecision to which we have just referred, and this is usually not offered as evidence. The term 'unconscious', except in its meaning as a group of emotionally-toned memories, has no justification. The two former terms which were merely descriptive, and the two latter which are purely conceptual have, by the gratuitous assumption of a psychic energy, become causal, and the entire mechanism seems now to be accepted as fact. Wohlgemuth has recently published a passage written by Breuer, a former collaborator with Freud, which points out the danger of constructions of this kind. This passage is as follows: "All too easily one gets into the habit of thought of assuming behind a substantive a substance, of gradually understanding by consciousness an entity. If, then, one has got used to employing local relations metaphorically, as, *e. g.*, 'Subconscious', as time goes on an idea will actually develop in which the metaphor has been forgotten, and which is as easily manipu-

lated as a material thing. Then mythology is complete." [3]

There is, however, another aspect of a theory of this kind which requires consideration. It is sometimes claimed that in psychology a causal explanation in terms of concepts is justified as an hypothesis, on the ground that it is a scientific procedure. Hart, for example, after discussing the physiological and psychological conceptions of the problems of insanity, says: "In modern psychology, conceptions are employed which cannot be demonstrated to have an actual phenomenal existence. 'Complexes' and 'repression,' for example, are conceptions devised to explain the phenomena which are observed, just as in physical science the concepts of 'force' and 'energy' are devised to explain the phenomena of motion. He will find, again, such conceptual abstractions as 'unconscious mental processes', involving the assumption that mental processes exist of which the individual himself is absolutely unconscious. It will perhaps appear at first sight that the assumption involves a psychological impossibility, and that if a mental process exists it must, *ipso facto*, be accompanied by consciousness. The reader must remember, however, that he is dealing with a conception which lays no claim to phenomenal reality, and that it belongs to the same generic type as the ether of the physicist." [4]

[3] A. Wohlgemuth, *A Critical Examination of Psychoanalysis*, 1923, 51 ff.

[4] B. Hart, *op. cit.*, 1916, 19.

Hart further supports his point of view on the ground of its utility. This, as we have seen, is a technological point of view, and as such it is justified. His appeal to science, however, cannot be ignored. For science, as we have also seen, does not, even from the traditional point of view, explain by concepts. However conceptually common sense may regard such terms as 'force', and 'energy', in physics they are descriptive terms for observed facts. Clifford, for instance, says of energy: "Energy is a technical term out of mathematical physics, which requires of most men a good deal of careful study to understand it accurately." Furthermore, if, at the present time, physics is giving up the terms 'force' and 'ether', it is because they are no longer accurate characterizations of the facts to which they refer. From the critical point of view science, it will be remembered, no longer attempts a causal explanation of the world; its problem is solely to bring new facts into relation with the old, to subsume them under known laws. The procedure of the conceptual type of theory is just the reverse of this; it begins by erecting a set of theoretical laws, and then adapts them to the facts.

58. Psychoneurological theories. There is another type of theory which, although it employs such terms as 'force', 'energy', and 'tension' in reference to conduct, nevertheless conceives of them as ultimately de-

riving from the nervous system. The two foremost representatives of this type of theory are Pierre Janet of France and Morton Prince of the United States. Formerly, there was so much in common as regards the detail of the two theories, that they might have been considered as one. Janet has, however, extended his theory in many directions and it will, therefore, be safer to consider the two theories separately. We begin with Janet.

Janet conceives, first of all, of a phylogenetic series of conducts or modes of action. This series is graded from simple to complex as regards the type and variability of conduct within a mode. These modes of action or conduct are called tendencies, and a 'tendency' is defined as "a disposition to produce a series of definite movements in connection with a definite stimulus." Every tendency is considered, furthermore, as a reserve of a definite amount of force capable under good conditions, of producing the series of movements. The term 'force' is employed loosely to mean "the expression of the possibility of action," and 'action' includes the power, the number, duration, and rapidity of movements. Every tendency is, then, the expression of a definite amount of energy or force, and those higher in the scale have a greater amount than those lower. The possibility of action, *i. e.*, the force, varies not only among individuals but also within an individual. For some individuals only the lower stages of conduct, the lower tendencies, are possible;

the highest stage is available only to the genius. Every individual has his average or normal amount of force, but this amount may be increased or decreased. It may be increased by rest, relaxation, certain drugs, diet, gymnastic exercises; it may be decreased by the difficulties of the problems of life—those of love, of fortune, of occupation, of family and society, of religion; and also by the discharges of the actions themselves, particularly when these are rapid or of long duration. The minimum amount of force in human individuals is called 'exhaustion.'

In addition to this hierarchy of tendencies, or modes of conduct, there is also in every individual a variable amount of *tension*, or a kind of mental tonus, which again may be raised or lowered from an amount normally characteristic of the particular individual. "There are in us," says Janet, "mechanisms and tendencies whose part it is to raise or lower tension according to circumstances. Changes in the sympathetic nervous system, changes in the secretions of the endocrine glands must here play an important part, but we must first have a good understanding of the psychic phenomenon and the alteration of the behavior, before we are able to discover their physiological conditions. From the beginning of life the living being knows how to perform the act of sleeping and the act of waking, and these acts, among other modifications, cause great changes in psychic tension. Later on he knows likewise how to relax in repose,

in play, in confidence, and how to grow tense, to put all his tendencies in a state of readiness, when there is a difficulty, danger, or a wait. When we rest, when we relax in the midst of friends, when we sleep, we lower the tension; on the other hand, when we begin an act, when we are in public, when we prepare for a contest, or when we simply wake, we become more tense. An important act, and especially a successful act, arouses just these tendencies to take a general attitude of high tension. Popular language recognizes the existence of these phenomena better than psychology when it speaks of 'taking it easy', 'keeping an eye open', being 'ready for anything', being 'all set.' At the extreme of these phenomena of stimulation are found the heat of composition and creative enthusiasm." [5]

The individual is thus endowed with an hierarchy of possibilities of action, and normally also with a certain readiness, a tension, for every possibility. Stimulation, which apparently may be either external or internal, results in action—a simple movement, an hallucination, a train of thought, or any activity of which the individual is capable. Janet formulates three "laws of stimulation." The first is the *principle of the mobilization of forces.* The individual "under the pressure of serious events" frequently displays an unexpected activity, he has reserves in latent tendencies that are mobilized for the action. These re-

[5] P. Janet, *Principles of Psychotherapy*, 1924, 237.

serves are forces and they are stored at the time of the organization of the tendency. "The size of this endowment is variable according to the tendency in question: it clearly seems much more considerable for primitive and fundamental tendencies and much reduced for higher and recently formed tendencies. Pain, the tendency to avoidance, fear, the tendency to flight, anger, the tendency to attack, the tendency to eat, and the sexual tendency, obviously have a strong charge. The rational and moral tendencies, on the contrary, have unfortunately received a very small endowment."[6] The second law is the *principle of psychological equilibrium.* There is at any moment a relation between the possibility of action, *i. e.*, the degree of force, and the degree of tension. It is this relation that largely determines the nature of the conduct. An act of will, for example, requires force under a high tension, and an act of excitement is the result of great force when a tension is low. Normal activity requires a balance of force and tension; an increase in force may be, and often is accompanied by an increase in tension but this result is not invariable. When, then, they are out of balance equilibrium may be restored in various ways. For example, when the charge of force is great with low tension, balance may be regained by discharging the force in a lower tendency; thus in great excitement a woman finds re-

[6] P. Janet, *op. cit.*, 227 f.

lief in tears. Under other circumstances tension may be raised and the action take place at a higher level. The third law is the *principle of irradiation* or of *psychic syntonization.* It frequently happens that the successful completion of an act, particularly one of a tendency high in the scale, results in a "general attitude of tension that lasts for some time." This accounts for the 'flush of victory.' "People who have accomplished a theft, the man who has offered a toast in a cabaret, those who have succeeded in being obeyed, those who have received a compliment, take a conqueror's attitude and maintain it for some time even while performing other acts." [7]

With this conception Janet is able to characterize the abnormal individual and to find a basis for all functional disorders. Such an individual is one who either by poor endowment, or by the strains and stresses of life is exhausted, *i. e.*, reduced in the possibility of action. The only modes of conduct possible for such an individual are those of the lower tendencies which are simpler, phylogenetically older, more automatic, and require less tension for their activation. The mood of exhaustion is depression; when in this condition the individual has still to meet situations which demand reflection, consideration, judgment, decision, all of which are higher tendencies of which the individual is incapable; therefore his activities take

[7] P. Janet, *op. cit.*, 237 f.

place through lower tendencies and abnormal conduct results. Impulsions, obsessions, the manias of teasing, of sulking, of cruelty, the passion for intellectual stimulation, daydreaming, many love episodes, are the expressions of a desire to escape depression. They arise from the unreasoned conviction that this or that act will bring relief. *Suggestion* "consists in artificially causing, in the form of impulsion, the functioning of a tendency that the subject cannot obtain in the form of personal will."[8] Hypnotism "is a momentary and passing transformation in the mental state of an individual sufficient to lead to dissociation of the personal memory and [it is] artificially caused by another [person]."[9] Finally, hysteria results "from 'fixed ideas', that is to say, from erroneous but fixed beliefs developed by a psychic mechanism analogous to that of suggestion."[10]

In his early observations Janet had found phenomena which he called "traumatic memories." They are memories of an event that persist with a train of various feelings and determine "directly or indirectly certain phases of the illness." In some cases, the memories "could not be expressed during waking consciousness, and they reappeared only under special circumstances in a different psychological state", *i. e.*, in hypnosis. Situations of this kind he called "subconsciousness through disintegration." "This

[8] P. Janet, *op. cit.*, 128, 259. [9] *Ibid.*, 133. [10] *Ibid.*, 257.

dissociation," he writes, " this migration of certain psychological phenomena into a special group seemed to me connected with the exhaustion brought on by various causes, and in particular by emotion." [11] These concepts—dissociation of a group of emotionally toned ideas, the subconscious (by which is meant the retention of a dissociated group which cannot be voluntarily recalled), and the expressions of the subconscious in tendencies of a lower and automatic type—serve to explain all of the various phenomena of hysteria, of fugues, and of double and multiple personality. The subconscious, it should be noted, is not an active agent; there is no conflict with consciousness, it is merely a name for a group of memories that have peculiar characteristics, and Janet now mistrusts the term.

It is from studies of abnormalities of this kind, particularly of cases of multiple personalities and of automatic writing, that Morton Prince has made his contribution to abnormal theory. He conceives of the 'subconscious' as a generic term which includes all processes of which the conscious personality is not aware, and these processes divide into two groups, the co-conscious and the unconscious. The latter refers, in general, to the associations available to the conscious personality; 'co-conscious' signifies a dissociated personality resulting from a splitting off and

[11] P. Janet, *op. cit.*, 39 f.

separation of a part of the normal associations of the conscious personality. The dissociated personality, *i. e.*, the co-conscious, has, therefore, a group of associations which the conscious personality has lost. Both the conscious and the co-conscious have their own energy, which is that of the nerve cells, and they may be but are not necessarily antagonistic. More specifically, the co-conscious is an organized system of nervous processes which have as correlates memories and "other particular ideas," and which, if organized with and activated by innate emotional factors, may function consciously. It may "exhibit intelligence of a high order," it may "undergo subconscious incubation and elaboration," it may "acquire a marked degree of autonomy," it may determine or inhibit conscious processes of thought, solve problems, enter into conflicts, and in various modes produce all sorts of psychological phenomena ("hallucinations, impulsive phenomena, aboulia, amnesia, dissociation of personality, etc.").

The theory is adapted to the explanation of disorders of the hysterical type, and in particular to cases of multiple personality. Originally there was little difference between Prince's 'co-conscious' and Janet's 'subconscious', but Prince has of late years been influenced by the psychoanalytic theories and Janet, as we have seen, tends to drop the concept altogether and to limit himself solely to what is observable. Both differ in many respects from

the psychoanalytic theories; they are less speculative, less conceptual, and in closer accord with psychological theory in general. There is in them, for example, no psychic energy, there are no entities, and no explanations in terms of causal concepts. Indeed, Janet, whose theory is much wider in its scope than that of Prince, avoids speculation in terms either of psychology or of physiology; his theory is little more than a generalized account of what his patients do; it is an account of conduct in the way in which any keen observer of the empirical kind might write about it. His *tendencies* are modes of conduct, his *force* is possibility of action, his *tension* is nothing more than the 'getting ready', the 'warming up' for action that is familiar to common sense. His "hierarchical system" of tendencies is, of course, hypothetical, and the reciprocal relation between degrees of force and of tension is not always clear. Another significant difference between the psychoneurological and the psychoanalytic theories is that the former limit the concept of the co-conscious and subconscious to what is considered to be a small group of abnormal phenomena, whereas the latter apply the concept of the unconscious to the whole range of functional disorders.

59. Theory of the abnormal and general psychology. At the beginning of this chapter it was said that, for

the most part, general psychology was not interested in formulating theories of the abnormal, but that some psychologists have undertaken to show that their theory of normal is also adequate to the explanation of abnormal conduct. We now turn to these theories. The most thoroughgoing attempt of this kind has been made by McDougall. In his *Outline of Psychology* he explains all conduct of living creatures by reference to purposive strivings or impulses. "All mental activity," he says, "is purposive, . . . it is a striving toward a goal however vaguely the goal may be thought of." [12] The striving has its roots in instinctive tendencies. It is one aspect—the primary emotions being another aspect—"of an activity, the activity resulting from the stirring, the coming into action, of some one or more of the instinctive dispositions." [13] On the basis of this principle McDougall attacks the problem of functional disorders. Fundamentally, his position is the same as that of Freud, the difference being that Freud's *libido* derives from the sexual instinct, whereas McDougall's *striving* derives from a number of instincts. McDougall finds many of the Freudian conceptions useful; but he drops the unconscious as an explanatory principle, and redefines complexes, dissociation, repression, and conflict, in terms of impulsive tendencies. He thus avoids mechanistic conceptions and reinterprets the

[12] Wm. McDougall, *Outline of Psychology*, 1923, 71.
[13] Idem, *Outline of Abnormal Psychology*, 1926, 26.

psychoanalytic theories in accordance with his own system of concepts.

In much less detail, Watson has presented a behavioristic theory of abnormal conduct. He begins by defining 'personality' as "an individual's total assets (actual and potential) and liabilities (actual and potential) on the reaction side." "Assets are that part of the individual's equipment which make for his adjustment and balance in his present environment and for readjustment if the environment changes." "By liabilities we mean similarly that part of the individual's equipment which does not work in the present environment and the potential or possible factors which would prevent his rising to meet a changed environment." [14] If, then, the personality's assets are greater than his liabilities, his behavior will be normal; if, on the other hand, his liabilities are greater than his assets, his behavior will be abnormal. The standard of adjustment is, for Watson, the purely practical one. The symptoms of the abnormal individual therefore are regarded as inadequate or inappropriate habits; the individual has either acquired responses which lead to a maladjustment to his environment, or else he is unable to acquire new responses which would make possible adequate adjustment to a new environment.

Most psychologists would agree that, in a final

[14] J. B. Watson, *Psychology from the Standpoint of a Behaviorist*, 1919, 297.

analysis, explanation must be made in terms of a nervous system. Even those who roughly explain by reference to responses, situations, instincts, habits, and the like, would admit that these causes must ultimately be carried back to the functions of the nervous system. The difficulty, of course, is to say exactly what these functions are. For, in the first place, the functions of the brain with which we are here concerned are gross functions; they are correlated with such complex phenomena as memory, attention, action, and thought. In the second place brain-physiology, as yet, can say little in detail about the functioning of the brain as a whole. Indirectly much has been learned by studying the effects of fatigue toxins, drugs, glandular secretions, brain circulation, brain development, pathological growths, surgical operations, et cetera, but when it comes to matters of detail little is known. Consequently the theories of general psychology are largely in terms of hypothetical brain processes. Such theories, however, are vastly superior to explanatory concepts or hypothetical dispositions of a purely mental kind; they are, as mental dispositions are not, subject to substantiation or to correction by future neurological investigation. The immediate problem, therefore, is to correlate meaning and behavior on the one hand with neural processes on the other. This correlation would be greatly facilitated if empirical psychology would recognize the intermediate correlation of meaning and sensory

process. This bridge has not yet been built, but when it is constructed many of the puzzling problems of the psychology of the abnormal will disappear.

Supplementary Readings for Chapter VIII

Paragraph

57. S. Freud, "The Origin and Development of Psycho-Analysis," in *Lectures and Addresses Delivered before the Depts. of Psychology and Pedagogy*, Clark University, 1910, 1 ff., also in *Amer. Jour. Psych.*, xxi, 1910, 181 ff.; *The Interpretation of Dreams*, transl. by A. A. Brill, 1912; *Three Contributions to the Sexual Theory*, transl. by A. A. Brill, 1910; E. Hitschmann, *Freud's Theory of the Neuroses*, 1917; B. Hart, *The Psychology of Insanity*, 1916; W. A. White, *Mental Mechanism*, 1911; C. G. Jung, *Psychology of the Unconscious*, transl. by B. M. Hinkle, 1916; A. A. Adler, *The Neurotic Constitution*, transl. by Glueck and Ting, 1917.

58. P. Janet, "La Tension psychologique, ses degrés, ses oscillations," in *Brit. Jour. Psychol.*, Med. Sec., i, 1920–21, 1 ff., 144 ff., 209 ff.; *Les Médications psychologique*, 1919; *Principles of Psychotherapy*, transl. by H. M. and E. R. Guthrie, 1924; *The Major Symptoms of Hysteria*, 1907; W. M. Horton, "The Origin and Psychological Function of Religion according to Pierre Janet," in *Amer. Jour. Psychol.*, xxxv, 1924, 16 ff.; M. Prince, *The Unconscious*, 1921; "The Psychogenesis of Multiple Personality," in *Jour. Abnor. Psychol.*, xiv, 1916, 73 ff.

59. W. McDougall, *Outline of Abnormal Psychology*, 1926; J. B. Watson, *Psychology from the Standpoint of a Behaviorist*, 1919, 392 ff.; H. L. Hollingworth, *Psychology of the Functional Neuroses*, 1920; G. Störring, *Mental Pathology in its Relation to Normal Psychology*, transl. by T. Loveday, 1907.

CHAPTER IX

ANIMAL PSYCHOLOGY

Everything goes by degrees in nature, and nothing by leaps, and this rule regarding changes is a part of my law of continuity. But the beauty of nature, which desires distinct perceptions, demands the appearance of leaps, and so to speak, musical cadences in phenomena, and takes pleasure in mixing the species. Thus although there may be in some other world mediate species between man and beast (according as we understand these words), and although there may be somewhere rational animals surpassing us, nature has found it good to keep them away from us, in order to give us, without contradiction, the superiority we have in our globe.—GOTTFRIED WILHELM LEIBNITZ.

60. The historical background. Animal psychology, as we know it to-day, dates from the closing years of the last century. Before that time there was a great deal of speculation concerning the question: Do animals think? The answer of primitive man to this question, had he thought about it, would have been an undoubted affirmative; he, in the first place, made no distinction between soul, mind, and life-principle, and since animals live they must also have minds. He had, furthermore, a tendency to humanize animals, to regard them as having all the powers which he himself possessed. Evidence of this naïve anthropomorphism in a primitive form, is still to be

found in animal folk tales. With the development of thought, however, there arose two closely related theories which tended to dehumanize the animal. The first of these is the egocentric doctrine that the universe was created solely for the use and pleasure of man. The second is the belief, which is found in the early Christian Church, that man alone possesses an eternal soul. Both these views admit that animals have a sensitive soul, that they can see, hear, and feel, experience anger and fear; but it is held that they lack the rational soul, the ability to think or to reason. At present, in addition to these two later theories, naïve anthropomorphism still survives; those individuals in particular who are fond of animals are prone to endow their pets with all human mental characteristics. In common sense, therefore, there are two separate motives working in opposite directions: the egocentric and religious tendency to deny, and the humanistic tendency to affirm reason in animals.

There also have been, of course, other motives than these for the denial or affirmation of reason in animals. Descartes, for instance, refused to grant a rational mind to animals, on the basis of his doctrine that in man body and mind are two separate entities. The former is a mere machine, but is sensitive—it has sensations and feelings because they are immediately dependent upon the body; the latter is the independent rational soul. Animals, on the other hand, have bodies similar to that of man, but they

lack the rational soul; they can sense and feel, but they cannot reason. Darwin, from another point of view, affirmed reason in animals. The theory of continuity in the animal series carries the implication that mind is also distributive, and that the highest form of animal mind is continuous with the lowest form of human mind. This theory at the hands of its early advocates, opened the way to naïve anthropomorphism, and some writers of the period, as, *e. g.*, Romanes, went to an extreme in their advocacy of 'reason' in the higher vertebrates. It may, however, be added that by common sense the Cartesian theory was the more readily accepted and the Darwinian theory the more easily rejected, because the former was in conformity with and the latter in opposition to the egocentric and religious points of view.

Beginning approximately with the decade following the year 1880, speculation of this kind gave way to experimentation; but the first systematic experiments were made in biology, not in psychology. Psychology had not yet become seriously interested in the problem of an animal psychology. Wundt, it is true, had written some chapters on the subject as early as 1863, and other German psychologists had anticipated a future animal psychology, but experimental psychology itself was only beginning and it was not yet ripe for animal experimentation. Biologists, then, including Lubbock in England, Forel in Switzerland, Plateau in Belgium and Mr. and Mrs.

Peckham in America, published during this decade a number of important studies of the behavior of insects and spiders. All of these investigators, however, took animal intelligence for granted; they did not scruple to resort to psychological interpretations of animal behavior, and they neglected to safeguard the logical basis of their inferences.

61. The logical basis of animal psychology. The first writer to attempt a thoroughgoing logical analysis of the basis of animal psychology was C. Lloyd Morgan. He, in the first place, regards animal psychology as a comparative study; that is to say, it employs a comparative method. "When the psychologist," he writes, "compares and correlates his own results with those of other introspective observers, he becomes, so far, a comparative psychologist, and by widening his basis, renders his conclusions more comprehensive. A further stage of the comparative method is reached, when he endeavors to correlate the results of introspective psychology with the conclusions reached by the physiological study of those nervous processes which are the concomitants of psychical states." This comparative method may be extended to animals because, "The key-note of modern biology is evolution; and on the hypothesis of scientific monism, here adopted, though not necessarily that of empirical dualism, we are not only logically justified in extending our comparative psy-

chology so as to include, within its scope, the field of zoölogical psychology, but we are logically bound to regard psychological evolution as strictly coördinate with biological evolution." "From the biological point of view the continuity of mind is one aspect of the continuity and integrity of the living organism." The fundamental presupposition, then, for extending the comparative method to animals is the law of continuity.

The logical principle involved in the comparative method is that of analogy. "Man, by anatomical and physiological research, has found in other men cerebral hemispheres with sensory-centers, control-centers, and so forth, similar to those which he believes that he individually possesses; and he infers that their psychology is of like nature to his own. He also finds in other vertebrates cerebral hemispheres with sensory centers and so forth, differing from man's chiefly in mass and complexity; and he infers that their psychology, though less developed and less complex than his own, has probably been evolved in similar lines. But when he comes to the insect, the crustacean, the mollusk, not to mention the worms, the sea anemone, or the amœba, he finds nervous systems so different in types of structure from his own, that he hesitates to draw any definite and positive conclusions concerning the psychical states of these animals. It is true that there are nerve fibers and nerve cells; but the manner of their arrangement is so different from that of the vertebrates to

which he belongs, that the careful student of zoölogical psychology is forced to conclude, that though the psychical states of insects and crustacea may be similar to those of man, they may be markedly dissimilar." [1] To this statement he later adds that analogical conclusions are reached by a double inductive process, that the psychologist must first induce the laws of human psychology and then, on the basis of these, infer from the behavior of the animal its psychological laws.

We may summarize Morgan's view by saying that, assuming the law of continuity, we may by the principle of analogy and on the basis of our knowledge of the human mind, infer the laws of animal minds. In biology the law of continuity is well established and its extension to include mental variations is a reasonable assumption. The principle of analogy is accepted in logic as yielding results of high probability when the resemblances (in this case, neurological resemblances) which are taken as the basis of the inference are as fundamental to the thing inferred (in this case, psychological experience) as we know them to be. It would seem, therefore, that Morgan had given animal psychology a secure foundation. Nevertheless, a few years later, a group of German physiologists, Beer, Bethe, and Uexküll, denied outright the possibility of a scientific animal psychology.

[1] C. Lloyd Morgan, *An Introduction to Comparative Psychology*, 1894, 40 ff.

The objections of this group of physiologists are, although not logically worked out, instructive. The problem of science is for them the determination of causes; and they deny any causal relation between "movements in space" and "sensations." The causes of animal movement, they declare, are physical, and they should be explained solely in physical and chemical terms. Furthermore, since the human individual can know only his own mind, he cannot know the qualities of the animal mind. By external observation "he observes only movements, and it is only by aid of analogical inferences, in that he compares these movements with his own, that he can assume psychological characteristics in other men and in the higher animals. This unscientific device, however, fails entirely for ascribing sensations to the lower animals, as well as to the lower centers of man." [2]

It will be observed that their conception of the problem of science as the determination of causes is the traditional one and was excusable, perhaps, a quarter of a century ago. There is, however, no justification for the apparent assumption that an animal psychology necessarily requires a causal relation between sensation and bodily movement. This is true only for the interaction theory of the relation between body and mind, and does not hold for the theory of

[2] Th. Beer, A. Bethe, and U. J. Uexküll, "Vorschläge zu einer objektivirender Nomenclatur in der Physiologie des Nervensystems," in *Biol. Centralbl.*, xix, 1899, 517 ff.

psychophysical parallelism or for the view that the psychophysical organism is unitary. Furthermore, the stricture against analogy as a scientific principle, is defensible only in the absence of a fundamental basis for the resemblances, such as the law of continuity affords. The resemblance between the human nervous system and that of, say, the social insect is —taken by itself—so remote that, however near the resemblance in behavior may be, the inference to similar minds is doubtless unscientific. It was at such inferences as this that these physiologists were aiming, but they overshot their mark. It is not necessary to deny all psychological experience to insects because of the great differences in structure between the nervous systems of man and the insect. The law of continuity, as a basic assumption, would lead us to expect some psychological experience throughout the animal series, and we should also expect differences between human psychology and that of an animal lower in the scale, as great as the differences in structure and complexity of their respective nervous systems. Kafka, moreover, has recently pointed out that those who deny mind to the lower animals base their arguments on morphological differences. They contend, for example, that the seat of human consciousness is the brain, that the lower animals have no brain, perhaps even no nervous system, and, therefore, that they can have no consciousness. This argument he likens to Fechner's

famous syllogism: "Man moves by means of legs; the snake has no legs; therefore the snake cannot move." If, however, we examine morphological similarities, and if, in addition, we turn to the analogues instead of to the homologues, that is to say, to functional rather than solely to structural resemblances, we then find an adequate basis for analogical inference. "The nervous system is only an especially high and finely differentiated development of a property (response to stimulus) which belongs to all living substance."[3] We conclude, then, that the contention of this group of physiologists is not sound. Had they limited their strictures to physiology their position would have been impregnable, for the biologist need not, and should not, go outside of his own science for his correlations.

62. Empirical psychology of animals. The discerning reader will have noticed that Morgan's psychology, and that of the German biologists we have discussed, is of the empirical kind. The one is searching for the logical basis for the ascription of consciousness to animals, the others deny the necessity of explaining the behavior of animals by reference to consciousness. Both assume that we can observe no other minds than our own and, therefore, that an animal psychology is possible only by inference.

[3] G. Kafka, "Tierpsychologie," in *Handbuch der Vergleichenden Psychologie*, i, 1922, 12 f.

Although all empirical psychologists would not subscribe to this view, it is characteristic of those who regard the phenomena of consciousness as the subject matter of psychology. Stout, a representative of this group, writes "No one can directly observe what is passing in the mind of another. He can only interpret external signs on the analogy of his own experience. These external signs always consist in some kind of bodily action or attitude. Thus, when a man clenches his fist, stamps, etc., we infer that he is angry. When a dog wags his tail, we infer that it is pleased. The knowledge acquired in this way must be carefully distinguished from the verbal description an individual may give of his own mental state. When a man tells us that he is, or was, angry, he is not directly expressing his anger, but his knowledge of his anger. He is conveying to us the result of his own introspection . . . what we here especially refer to is the interpretation of signs, which may or may not be noticed or understood by the subject who displays them. It may happen that the inference from the direct expression of the mental state may contradict the subject's own assertion about it. He may show most unambiguous symptoms of anger, and at the same time declare vehemently that he is not angry." [4] Angell, who teaches that consciousness is the guide and control of bodily conduct, also says:

[4] G. F. Stout, *A Manual of Psychology*, 1913, 47.

"We may recognize squarely that all the evidence which we can secure will rest for its value upon the reliability of analogy. No one knows that any other human being is conscious save in so far as the conduct of that person leads him to believe that a mind like his own is directing the conduct. The same thing is true in justifying the inference of consciousness in animals. The practical problem is to determine how closely the behavior of animals resembles that of man, and in what respects it differs." [5] It would seem, therefore, that from both points of view the logical basis of animal psychology must be similar to that which Morgan, himself an empirical psychologist, has proposed. The inference which Stout has to make is, however, simpler than that of Angell. Both must infer that the animal is conscious, that if it has qualities it is aware of them as meaning some object; but Angell must also, in the concrete case, infer that the animal employs its meaning as guide and control of its behavior.

Since the dual-reaction psychologies deal with a sensitive organism which, when stimulated, either responds or reacts in two ways, as conscious experience and as behavior, both of which are subject matter of psychology, it would seem, at first sight, that there is no clear line of demarcation between human and animal psychology. From the 'reaction' point of view, any

[5] J. R. Angell, *Chapters from Modern Psychology*, 1912, 245.

organism in the animal series, which of course includes man, may by external observation be seen to respond to a stimulus. There is no guarantee, however, that any organism in the series responds consciously to a stimulus, because conscious experience is observable only by introspection or self-observation and this method is, according to Warren, "not practicable in animal psychology."[6] For Woodworth, observation in animal psychology is "exclusively objective."[7] Conscious response in animals must, therefore, be reached by inference. The logical basis of animal psychology from the "reaction point of view" is, therefore, twofold; as behavior its logic is the same as that of biology, but as conscious experience it is the same as that of 'consciousness psychology'. It may be observed that whenever the behavior of an animal serves as the basis of an inference to conscious experience, an externally observed psychological experience of one kind becomes the basis of the inference to a psychological experience of another kind.

From Bentley's point of view the matter is much more complex; for he admits as subject matter of psychology both 'experience', in the sense we have called existential, and the 'functions' of the total organism. Animal psychology, for him, is based upon

[6] H. C. Warren, *Human Psychology*, 1919, 13, 222, 296, 338.

[7] R. S. Woodworth, *Psychology: A Study of Mental Life*, 1921, 8 ff., 14, 39 f.

two principles: genetic continuity, and 'psychophysical conjunction'. By the latter he means that "mental and bodily factors are regularly and uniformly conjoined, and it rests upon thousands of such empirical facts as the conjunction of color qualities and visual receptors, the sensimage and processes in the cortex, the associative train and the temporal integration of neuronal tracts." These principles serve (1) as a basis for inferring existential experience in the animal. When these 'experiences' are known, and when we also know the receptor and effector organs, the central nervous system of the animal, and the modes of bodily activity or behavior, the same principles serve (2) as a basis for inferring functions. Methodologically the "procedure here is a combination of inspection, physical and psychological, and inference. The latter "must be especially safeguarded in its use." [8]

From the point of view of behaviorism, animal psychology has, of course, the same logical background as that of human psychology. This view, it will be recalled, originated in animal psychology, and by reason of that same mistrust for analogical inference of conscious experience from the behavior of animals that we found in the German physiologists discussed above. Behaviorism, however, has not attempted to justify on logical grounds, its rejection

[8] M. Bentley, *The Field of Psychology*, 1924, 510 ff.

of the principle of analogy. It merely refuses to describe behavior in terms of conscious experience, and employs instead biological terms like 'responses', 'instincts', 'habits'. The logical basis of this animal psychology is, therefore, the same as that of biology.

63. The existential psychology of animals. We turn, now, to the problem of animal psychology as it may be formulated in existential psychology. Since, from this point of view, *mind* is the whole world of experience regarded as logically dependent upon the nervous system, it follows that we shall find mind wherever in the animal scale a nervous system appears. Moreover, as Kafka has pointed out, since the nervous system is but a specialized development of a general property (response to stimulus) of all living substance, it may be assumed that mind is coterminous with life. The law of continuity, therefore, becomes the fundamental presupposition of animal psychology. The problem of existential psychology is to describe the animal mind as existent, and its solution is, in the last analysis, a matter of method. The method of existential psychology is, it will be recalled, observation, and in animal psychology the animal must do its own observing. In the concrete case, and under experimental conditions, the behavior of an animal might be taken as a report of psychological experience were it not for the fact that, at the present time, it is impossible to guarantee

an existential attitude on the part of the animal observer. Its experience seems to be a part of the total situation to which it responds, and its attitude is, consequently, empirical rather than existential. Its report then must also be empirical. In human psychology whenever the existential aspect of an empirical experience is known, the latter may be restated in terms of the former; if, for example, a common-sensible person speaks of the "color of the sky on a clear day", the "odor of a rose", the "taste of quinine", the psychologist can restate these experiences in terms of quality. In animal psychology the experimenter who records the animal's report may also, from his psychological knowledge, interpret the behavior of the animal as a report of existential experience. The logical basis of this interpretation is, of course, analogical, and analogy can in itself give only probabilities and not facts; but this does not mean that the facts of animal psychology as distributive may not have a high degree of probability, as high, indeed, as many other facts of science in general. To take a concrete case, there need be no greater doubt that a barnyard fowl has the experience "red" than that the chemical composition of the sun includes sodium, or that Polaris is fifty light-years distant from the earth.

Supplementary Readings for Chapter IX

Paragraph

60. G. W. Leibnitz, *New Essays Concerning Human Understanding*, transl. by A. G. Langley, 1896, 552; J. G. Frazer, *The Golden Bough*, abridged ed., 1922; H. A. P. Torrey, *The Philosophy of Descartes in Extracts from his Writings*, 1892, 281 ff.; C. Darwin, *Expression of Emotion in Man and Animals*, 1872; G. J. Romanes, *Animal Intelligence*, 1893; W. Wundt, *Vorlesungen über Menschen- u. Thierseele*, 1863, 2d ed., transl. by J. E. Creighton and E. B. Titchener, 1894; J. Lubbock, *Ants, Bees and Wasps*, 1893; A. Forel, "Sur sensations des insects," in *Recueil zoöl. suisse*, iv, 1898; F. Plateau, "Récherches experimentelles sur la vision chez les arthropodes," *Bull. Acad. Roy. Belgique*, 3d Series, x, 1895, 231; G. W. and E. G. Peckham, "Some Observations on the Mental Powers of Spiders," *Jour. Morph.*, i, 1887, 383.

61. M. F. Washburn, *The Animal Mind*, 1926, 8 ff.; E. B. Titchener, "Were the Earliest Organic Movements Conscious or Unconscious?" *Pop. Sci. Mo.*, 1902, 458 ff.

62. J. B. Watson, *Behavior: An Introduction to Comparative Psychology*, 1914, 1 ff.; W. S. Hunter, *General Psychology*, 1919, 13 ff.; Wm. McDougall, *An Outline of Psychology*, 1923, 43 ff.; E. B. Titchener, "Psychology as the Behaviorist Views It," *Proc. Amer. Phil. Soc.*, liii, 1914, 1 ff.

63. E. B. Titchener, *Textbook of Psychology*, 1910, 27, 30 ff.; "Psychology as the Behaviorist Views It," *loc. cit.*, 17; *A Beginner's Psychology*, 1915, 12 ff., 219 f.

CHAPTER X

EXPERIMENTATION IN ANIMAL PSYCHOLOGY

I dare say you have thought of experimenting on the mental powers of spiders by fixing their trap-doors open in different ways, and at different angles, and observing what they will do. —CHARLES DARWIN.

64. The conditions of animal behavior. Although, as we have seen in the last chapter, the fundamental presupposition of animal psychology is the law of continuity, and although inferences to psychological experience at large in animals is justified and controlled by similarities in structure and function of living substance in man and animals, the inference in every concrete case is based upon the behavior of the animal, upon its reaction or response to the situation in which it at the moment happens to be. The individual animal is, of course, the biological individual with innate and acquired tendencies which are, in part, characteristic of the species to which it belongs, and in part peculiar to itself as an individual which varies from others of its kind. The animal, like the human individual, has a 'personality'. The individual has, furthermore, a bodily structure which in itself predisposes it to certain kinds of behavior; fishes cannot

walk or fly, and birds cannot burrow in the ground. What the particular animal does in any situation depends, in the first instance, therefore, upon what it, as a member of a species can do. Its behavior depends, however, in the second instance, upon the nature of the situation. In general, the member of a species is, as the biologists say, adapted to the particular environment in which it lives. It is, by structure and tendency, adapted to a particular set of more or less variable conditions. Fish, for example, can live only in water the temperature of which is, within limits, variable, and the intensity of illumination, depth of water, strength of current, suitable spawning beds, and food supply, are also variable. A marked change in any one of these variables is almost certain to be accompanied by a change in the animal's behavior. The situation contains, however, still another set of conditions which is significant for the behavior of the animal, namely, the physiological condition of the animal itself. A dog, for example, that is replete or fatigued or unexcited, will not, in a situation otherwise the same, behave like a dog that is hungry, fresh, or frightened. The behavior of an animal, depends, therefore, upon its structural form, the innate tendencies characteristic of the species to which it belongs, its own 'personality', the nature of the change in the situation of the moment, and the physiological state of the animal itself. Before inference can be made safe, all of these factors must either be known or brought

under control; and knowledge of this kind can be gained only by observation.

65. Uncontrolled observation. There are, in general, two ways in which observation in animal psychology is made. In the first, observation is uncontrolled. This is the method employed by naturalists when they observe the activities of an animal, or of a group of animals, in the environment in which it lives. At the hands of an observer who knows the morphology of the animal, who is trained to distinguish between what is observed and what is inferred, and who is on his guard against naïve anthropomorphism, the method yields important results of a general kind. This, indeed, is the only way in which we may learn what the normal activities of a particular species are—how it obtains food, how it builds its nest, how it cares for its young, etc. It is impossible, however, to infer much about the mentality of an animal under these conditions. Bethe, for example, observed that ants roamed far from their nests and that they found their way back, but whether they did it by sight, by smell, or by feel he could not say; he observed, also, that when an ant, by mistake, got into the nest of a strange species it was killed, but how the intruder was recognized as a stranger, Bethe again could not discover by unaided observation. This method, then, gives knowledge of the instinctive tendencies of a species, and this kind of knowledge is,

as we have just seen, fundamental to our understanding of the behavior of the animal; but the conditions under which the observations are made are so complex and variable that they must be isolated, varied at will, and repeated before the specific responses of an animal can be known. That is to say, we must have recourse to experiment.

66. Experimental observation. The technique of animal experimentation requires, first of all, that the individual shall be habituated to its surroundings. In some cases, as that of animals that can be experimented upon in their natural environment, or that of microscopic animals that are at home in a drop of stagnant water, or again, animals somewhat higher in the scale, like the earthworm whose natural environment may be transported to the laboratory, this condition is easily met. But where the experimentation must be performed with animals still higher in the scale and under circumstances that require their confinement, they must be accustomed to the new environment, their nervousness and fear overcome, and their good health maintained. In the case of some animals and in certain situations, experimental technique also demands that the animal shall be provided with an incentive or motive for responding to the experimental situation. In general, this incentive is either a natural tendency or a physiological condition of the animal; one that normally lives in the dark

will strive, when brought into the light, to find a dark place; or again, one that is hungry will make an effort to obtain food. Punishment may, in some cases, serve as a motive for inhibiting a natural response which, in the experimental situation, is not desired. Some animals, particularly those that have a brain and nervous system, may have not one but many incentives; sometimes more than one motive may be made to work together, as for example, a hungry cat inclosed in a box will strive to free itself not only to get food but also to attain freedom; at other times the motives may work in opposite directions—a hungry cat will not make the same effort to get in a box for food as would a rat or a porcupine, neither of which object to inclosed spaces. We need not suppose, of course, that the incentive or motive is necessarily conscious; the term is employed only in the sense of a determining tendency.

The experiments themselves may be divided into two groups according to the kind of situation that is presented to the animal. There are (A) *Situations in which one or more factors are controlled.* The general problem is to determine whether the animal will respond to a particular mode of stimulus, or whether it can discriminate differences in stimuli of the same or different modes. In one type (1) a single mode or kind of stimulus is given; that is to say, the total situation is varied by a single qualitative or quantitative factor. A classical instance is Audubon's exper-

iment to discover whether vultures are guided to their prey by sight or by smell. He first stuffed a deerskin with dried grass and exposed it in an open field, where it was found by a vulture, the skin torn open, and some of the dried grass pulled out. He then concealed with a covering of cane an "extremely fetid" hog in a ravine where it was found by dogs but not by vultures. He next made a trail of the blood of a freshly killed pig, to a ravine where the body of the pig was hidden. The vultures found the blood and followed its trail to the ravine where the body of the pig was found and devoured. In an experiment of this type the stimulus may be simple—a color, an odor, a change in temperature, a mechanical pressure; or it may be complex—a visual form, change in size of an object, a movement. The stimulus may also be varied in time—it may be continuous (of greater or less duration), or it may be intermittent. A somewhat unusual form of temporal variation is seen in an experiment devised for the purpose of observing any change that might occur in the development of an instinctive tendency. Young sparrows were reared in a nest of canaries. The sparrows thus had no opportunity of hearing the song of their own species, but heard frequently the song of another species. They eventually imitated part of the song of the canary, and adopted outright the canary's call-note. This type of situation (variation of a single mode of stimulus) is the one usually employed in experiments

with invertebrate animals—microscopic animals like the amœba and paramecium, or animals higher in the scale like the jellyfish, the worm, insects, and spiders.

In experiments with vertebrates the usual type of situation is (2) intramodal variation; two or more stimuli are presented simultaneously or successively to the animal, and it is required to discriminate between them. If, for example, it is desired to know whether a bird can distinguish some one among several hues, a number of boxes may be prepared, every one of a different hue, and food placed in the box that has the hue to be distinguished. The animal must now learn, if it can, to go directly to the food-box upon release. The experimenter must, of course, be sure that the animal does not, instead of hue, distinguish differences in tint (or shade) and in chroma (saturation); or that it is not guided by spatial position (*i. e.*, in successive experiments the position of the food-box relative to the other boxes must be varied). An incomplete form of this type of experiment, and one much used in early work, is called the 'preference method'. Two stimuli are offered simultaneously, and the animal is allowed to choose between them. This method has been called incomplete because, even where preference is not shown, lack of discrimination is not necessarily proved; for instance, if two stimuli are chosen by the animal an equal number of times we must not con-

clude that the animal cannot distinguish between them. If, on the other hand, the animal shows an invariable preference for one of the two stimuli, we may safely conclude that it does distinguish them. The method has been employed with success with microscopic animals in the following way: The one-half of the shallow dish which contains a number of the animals is dark or colored, and the other half is of a different brightness or color. It may now be observed whether all of the animals collect in the one or the other side of the dish. A vertebrate animal that shows no decided preference for one of a pair of stimuli may be forced to a discrimination by punishment (*e. g.*, by an electric shock), whenever it chooses one of the two stimuli.

Another form of this type of experiment, now much in vogue, is Pavlov's method (salivary reflex method, conditioned reflex method). As first performed, a small opening in the lip of a dog was made and a glass tube inserted through which the flow of saliva could be drained. A stimulus, *e. g.*, a sound, was first given, and then immediately after it, another stimulus (sight or smell of food) that reflexly increased the flow of saliva. When this experiment had been repeated a number of times, it was found that the salivary secretion was increased in amount by the first stimulus alone, that is to say, the glandular response to the sight or smell of food was transferred to the sound. Instead of the former unconditioned reflex, there is

now, in Pavlov's terminology, a conditioned reflex. When the animal had reached this stage the first stimulus was then varied in quality or intensity. The inference is that if a variable stimulus fails to excite the salivary secretion the dog discriminates the difference. By systematic variation of the first stimulus, a differential threshold may be obtained, *i. e.*, the amount of the difference which can just be discriminated can be measured by the relative frequency with which the glandular secretion is excited. For example, a dog whose response was conditioned to a circle did not respond to an ellipse; the ratio of the two axes of the ellipse was then varied until that form of the ellipse was found which the dog confused with that of the circle. This experiment has been employed with a wide range of stimuli—tones, colors, pressures, pain, variation in form such as circle-ellipse, rectangle-square, and so forth.

Still another form is Yerkes' 'multiple-choice method' in which the spatial arrangement of the stimuli is varied. A number of keys or levers are presented to the animal after he has been taught that by pressing one of the keys he will obtain food or some other reward. The number of keys presented in any trial may be varied from 1 to 12, and the particular key that brings the desired result is never the same in two successive trials, *i. e.*, the particular key has a relative and not an absolute position. Suppose, for example, that the experimenter decides that the

relative position of the key shall be the third from the left. In the first trial, four keys, perhaps Nos. 9, 10, 11, 12, may be offered; the animal must, in this case, press No. 11. In the next trial, perhaps five keys, Nos. 4, 5, 6, 7, and 8, may be offered; the animal must now press No. 6. It is the intent of the experiment to require the animal to obtain the 'guiding idea' (third from the left) before it can at once press the correct key.

We turn, now, to the second group of experiments, which consists of (B) *Situations which are complicated by the introduction of an obstacle.* The obstacle may be natural or artificial to the situation, but there also may be instances in which the naturalness or artificiality of the obstacle is, for a particular species, a matter of interpretation. In most cases the obstacle is purposely introduced by the experimenter, but observation has been made also under natural conditions where the obstacle was introduced by chance into the animal's environment. Jennings, *e. g.*, observed the behavior of a free-swimming paramecium when it encountered a bit of débris. The reactions of the lower animals in such a situation are generally found to be of a characteristic type which is the same for all individuals of the species and is, consequently, instinctive. Vertebrates, however, in the natural state, often learn by individual experience how to overcome a particular obstacle, and unless one happens to observe the course of the learning behavior of the animal,

it is impossible to say whether the act is characteristic of the species, or in what way the act came to be learned. It is for this reason that a chance observation of an acquired experience of this kind, without knowledge of the previous history of the particular animal, is apt to be misleading. In the experiments which we now have to discuss, an obstacle is introduced, therefore, for the purpose of observing the response of the animal in a novel situation. The purpose of one type (1) is to determine whether it is possible for an animal to inhibit an instinctive tendency. Can a fish, for example, inhibit the tendency to strike at a minnow? The experiment has been performed in the following way:—A plate of glass is inserted in an aquarium in such fashion as to divide it into two parts. On one side of the partition is a predatory fish and on the other a number of minnows; the fish strikes at the minnows, and collides with the partition. Eventually, it ceased to strike, and this tendency was inhibited for a time, even after the glass was removed and the minnows swam about the fish.

Another type (2) is called the 'puzzle-box method'. In this experiment the animal, a hungry cat, let us say, is put in a cage the door of which is closed but may be opened by pulling a string which hangs down inside the cage; food is placed outside where the cat can see and smell it. The problem now is: Will the caged cat, in successive experiments, eventually learn to pull the string immediately, when put in the

cage? The experimenter observes in detail the successive movements of the animal and, in case it learns the trick, the course in which useless movements are eliminated, the time required for the solution of the problem in every trial, and the total number of trials necessary to solve the problem.

A third type of the experiment is (3) the labyrinth or maze method. Food is placed in a position where it can be reached only by following a long and tortuous pathway in which there are many blind alleys. The animal must learn to run the maze in the shortest possible time, and without making any error by entering blind alleys. The complexity of the maze can be adapted to various species; it is especially suitable for rats or for animals that live in burrows, but it has also been employed with birds, sheep, monkeys, and other species. The labyrinth has been combined with the 'preference method' of the first group by Yerkes who devised a simple labyrinth for crayfish, that had only one blind alley. A variant of both the labyrinth and puzzle-box methods sometimes employed, is called the 'imitation method'. An animal that is new to the situation is allowed to watch another, that has solved the problem, run the maze or escaped from the box. The first is then given the problem, and its subsequent behavior observed to see if it has profited by watching the behavior of the other animal.

Still another type (4) may be called the 'insight method' or intelligence test (*Intelligenzprüfung*).

This experiment was early employed by Lubbock with ants, and by Hobhouse with monkeys, but it was first systematically used by Köhler in his work with chickens and chimpanzees. The experiment consists in placing in the animal's environment, a natural obstacle such as it might meet under ordinary living conditions. The object is to devise a problem that the animal may be expected to 'understand', to create a situation which the animal must grasp if it is to be surmounted. Köhler, for example, placed food on the ground at a point where the ape could not reach it from its cage. Sticks which the animal already knows how to use, are in the cage. The test now is: Will the ape employ the stick to rake in the food? Again, food was suspended from the top of the cage beyond the ape's unaided reach; but boxes were provided which the ape might use to climb upon and thus reach the food. In experiments of this kind the problems set may range in difficulty but they must, of course, be adapted to the powers of the individual.

From this brief survey of the experimental methods it may be seen that experimental observation at the hands of a trained experimentalist should furnish a large number of facts which could not possibly be gained by uncontrolled observation. The experimenter who must frequently handle the animal learns its general disposition, the characteristic traits of its personality. The experiments of group *A* should reveal the kinds of stimuli to which the animal

can respond, and also its ability to discriminate qualitative and quantitative differences. The situations of group *B* should show the ability of the animal to adjust itself to new situations, to form new habits, to inhibit innate tendencies and old habits, to remember and to utilize earlier experiences, and, without having to form a new habit, to surmount obstacles natural to its environment. How the results of these experiments are to be interpreted by psychology is another problem which we shall consider in the next chapter.

Supplementary Readings for Chapter X

Paragraph

64. H. S. Jennings, *Contributions to the Study of the Behavior of Lower Organisms*, 1904, 111 ff.; M. F. Washburn, *The Animal Mind*, 1926, 11 f.

65. A. Bethe, "Dürfen wir den Amiesen u. Bienen psychische Qualitäten zuschreiben?" in *Pflügers Arch.*, lxx, 1898, 15; G. W. and E. G. Peckham, *On the Instincts and Habits of the Solitary Wasps*, 1908; C. L. Morgan, *Habit and Instinct*, 1896; J. Lubbock, *Ants, Bees and Wasps* (1881), 1906.

66. F. Darwin, *More Letters of Charles Darwin*, i, 1903, 338; E. L. Thorndike, *Animal Intelligence*, 1911, 26, 35 ff., 45 ff., 56 ff., 61 ff., 169 ff., 176 ff.; R. M. Yerkes, "The Rôle of the Experimenter in Comparative Psychology," in *Jour. Comp. Neurol. and Psychol.*, v, 1915, 208; T. W. Mills, "The Nature of Animal Intelligence and Methods of Investigating It," in *Psychol. Rev.*, vi, 1889, 262; Ed. Claparède, "Die Methoden der tierpsychologischen Beobachtung u. Versuche," in *Bericht u. d. III Kong. f. exp. Psychol.*, 1909, 22; W. Köhler, *The Mentality of Apes*, transl. by E. Winter, 1925; J. B. Watson, *Behavior: An Introduction to Comparative Psychology*, 1914.

CHAPTER XI

PSYCHOLOGICAL EXPERIENCE IN ANIMALS

Compared with men, it is probable that brutes neither attend to abstract characters, nor have associations by similarity. Their thoughts probably pass from one concrete object to its habitual concrete successor far more uniformly than is the case with us. In other words, their associations of ideas are almost exclusively by contiguity.—WILLIAM JAMES.

67. The law of parsimony. We have, in this chapter, to consider the problems involved in the psychological interpretation of animal behavior; and we begin, first of all, with a rule of interpretation long known to science which is attributed to William of Occam, and which is known as 'Occam's Razor', or the law of parsimony. As originally formulated this rule was that entities or principles should not be multiplied beyond necessity. In traditional science it came to mean that we ought not to suppose the existence of anything not necessary to explain admitted facts, and in studies of animal behavior the rule has generally been interpreted as meaning that of two possible explanations the simpler is to be preferred. Since animal behavior is subject matter of both biology and psychology, biologists and some psychologists have assumed that the simplest is a

physical explanation. This was the view of Beer, Bethe, and Uexkühl, to whom we have referred above, and for the lower animals in particular the simpler physical explanation has been worked out in the form of a theory by Loeb. Plants, we know, grow toward the light; sunflowers turn in such fashion as always to face the sun; morning-glories close when the intensity of light reaches a certain point. Movements like these are, in the theory, called 'phototropisms' (*photos*, light; *tropism*, a turning), and they may be explained solely in terms of molecular changes in the structure of the plant. The same principle may, it is said, explain also all of the behavior of certain species of animals. There are many different tropisms corresponding to the kind of stimulus employed; a response to currents of air or water is a rheotropism; to chemical stimuli, a chemotropism; to electric currents, a galvanotropism; to heat, a thermotropism; to gravitation, a geotropism. It is argued, further, that it is simpler to explain the behavior of an invertebrate animal in terms of tropisms rather than those of psychological processes; it is, for example, simpler to say the moth is compelled by mechanical forces to fly into the flame than to say it is 'attracted', in a psychological sense, to the flame. When, however, Loeb has to explain the behavior of animals that shows the effects of past experience he employs a principle which he calls 'associative memory', and which has psychological implications. Other writers,

when considering the complex behavior of the higher animals, have debated two sets of causes, the one purely mechanical or automatic such as reflexes, instincts, and habits, the other psychological such as understanding, purpose, and reason. Is, for example, the complex life of social insects to be explained by instinct or by reason? Does the bird build its nest by instinct or according to a purposive plan? The answer to these questions by some biologists and psychologists, is again, that the physical is the simpler explanation, and under the law of parsimony is to be preferred. It was this consideration, indeed, that led Watson to a purely mechanical explanation first of animal and later of human behavior.

At the hands of those empirical psychologists who regard conscious activities as causal, the term 'simpler' has taken on another meaning. Some conscious activities are simpler than others; sensation is simpler than perception, and perception than conception; perceptual inference is simpler than ideational inference; associations by contiguity are simpler than associations by similarity. The principle of parsimony as, in this sense, applicable to animal psychology has been formulated by Lloyd Morgan and is known as *Lloyd Morgan's Canon*, or as Morgan's Canon of Interpretation, and it runs as follows: "In no case may we interpret an action as the outcome of the exercise of a higher psychical faculty if it can be interpreted as the outcome of the exercise of one which stands

lower in the psychological scale." In a subsequent formulation he substituted 'psychical process' for 'psychical faculty'. Let us suppose, by way of illustration, that a dog is seen to lift the latch of a gate with an upward thrust of his head and then to push the gate open. According to Morgan's Canon it is better to say that the dog had in some way learned by mere association that this action would open the gate, than to say that the dog inferred from the mechanical principles of locks and gates that this particular action would bring the desired result. Morgan himself applied this rule only to those animals that by their behavior showed the ability to profit by experience, for this was his criterion of mind. For animals lower in the scale he fell back upon biological principles as the simpler explanation.

So much for the law of parsimony and the meanings put upon it. Let us now see what it signifies. From all that has been said it is clear that we are in the atmosphere of traditional science. The problem is to *explain* the behavior of the animal in the causal sense. Some animals are positively phototropic—they turn toward the light; others are negatively tropistic—they turn away from the light. The question is: Why? To ascribe either mechanical forces or psychological activities as causes is characteristic of science in the traditional sense. It is also a trait of traditional science to differentiate the special sciences by reference to subject matter, and since animal behavior is subject

matter of both biology and psychology the limitations of both are confused. We should expect biology to explain solely in biological terms, and for it to be forced to have recourse to psychological terms would seem to be an admission of defeat. Since we have found that empirical psychology of the 'consciousness' kind has not one but several causal principles, we need not be surprised at the easy change from one to another. The equivocal meaning of the term 'simpler explanation' is due, therefore, to the failure to discriminate the proper fields of the two sciences, and to the difficulty that the causal concept has given the 'consciousness' psychologies.

Within traditional science the value of the law, however, is questionable in other ways. Morgan, himself, brought two possible objections to this rule. "It may be urged," he said, "that it is ungenerous to the animal." He contends, however, that this objection assumes the point to be proved. "The scientific problem is to ascertain the limits of animal psychology. To assume that a given action may be the outcome of the exercise of either a higher or a lower faculty, and that it is more generous to adopt the former alternative, is to assume the existence of a higher faculty which is to be proved." Furthermore, since science is in search of truth, "generosity is not a scientific attitude." A second possible objection which Morgan raises is that "we may be shutting our eyes to the simplest explanation of the phenomena." By the

term 'simplest' he here means, however, the easiest explanation. "But", he replies, "surely the simplicity of an explanation is no necessary criterion of its truth. The explanation of the genesis of the organic world by direct creative fiat, is far simpler than the explanation of its genesis through the indirect method of evolution."[1] There is another objection, however, which Morgan did not consider and which is more serious. "If," Holmes remarks, "we apply the principle of Morgan to the psychology of our fellow human-beings we should be continually led astray. So, in our interpretation of the psychology of the higher animals, we may very frequently be 'missing it' more or less widely in our adherence to this principle."[2] In other words, if truth is the objective it may be as great a mistake to deny a higher because an action may be explained by a lower faculty, as it is to assume a higher when a lower faculty would serve. To admit this, however, is to mistrust the value of the law.

In general the correct logical procedure requires the construction of that hypothesis which best fits all of the facts; and if the facts themselves are admitted and this procedure followed, the application of a rule like Morgan's is unnecessary. That hypothesis which is best correlated with the facts will assume neither more nor less than the facts themselves

[1] C. L. Morgan, *Introduction to Comparative Psychology*, 1894, 53 ff.
[2] S. J. Holmes, *The Evolution of Human Intelligence*, 1911, 159 f.

justify. The law of parsimony, however, in its strict sense may serve as a test of the hypothesis. Morgan's Canon was undoubtedly of considerable service in the early stages of animal psychology, because it afforded a salutary check against the natural tendency to naive anthropomorphic interpretations. At the present stage of animal investigation, however, the canon may be safely discarded for the broader and safer logical procedure of science in general.

68. Criteria of psychological experience. In the early days of animal psychology, attempts were made to find some 'objective criterion' by means of which it could, at once, be determined whether or not an animal has psychological experience. There were two motives for this attempt. The biologists who denied psychological experience to the lower were willing to concede it to the higher animals, and consequently, they sought an objective criterion of mind. Those psychologists, on the other hand, who, because the behavior of invertebrate animals is so dissimilar to that of human individuals, were unable to infer psychological experience in the lower animals, also sought for an objective criterion of mind. Since neither of these two views could accept mere response to stimulus as a criterion, others were proposed. It was said, in the first place, that preference for one of two stimuli is evidence of psychological experience because in such case the animal evidently makes a

choice. This, however, is subject to the objection pointed out by Washburn, that "choice" may be found also in inanimate nature, as for example, "when hydrochloric acid is added to a solution of silver nitrate, the ions of chlorine and those of silver find each other by an unerring 'instinct' and combine into the white precipitate of silver chloride, while the hydrogen and the nitric acid similarly 'choose' each other."[3] The analogy is obvious enough, but the criterion has a more serious difficulty. The term 'choice' as a criterion of psychological experience implies a conscious choice, an act of will, and this is itself an interpretation put upon the animal's behavior before it becomes a criterion.

A second criterion is teleological. It was said that when an animal shows evidence of purpose in its adjustment to a situation there is evidence of mind. This not only entails the same logical difficulty as the choice criterion, but also it is a metaphysical and not a scientific principle.

A third criterion that was suggested is 'variability of response'. It was argued that the responses of an animal that may be regarded as mechanistic should, other things being equal, be invariable; and that, since in the human organism the more responses become mechanized the less do they tend to be accompanied by consciousness, variability of response may be re-

[3] M. F. Washburn, *The Animal Mind*, 1926, 26 ff.

garded as evidence of psychological experience. This rule has again failed of acceptance because, in the first place variability is always relative, *i. e.*, even machines show some variability; and in the second place, in the human individual psychological experience is not always absent in mechanized movements. We cannot assume, therefore, either that invariability of response is indicative of no psychological experience or that mere variability is an unequivocal mark of psychological experience.

Still another criterion, one proposed by Loeb, was that 'associative memory' is a sign of psychological experience. By associative memory he means "that mechanism by which a stimulus brings about not only the effects which its nature and the specific structure of the irritable organ call for, but by which it brings about also the effects of other stimuli which formerly acted upon the organism almost or quite simultaneously with the stimulus in question."[4] This implies that if by its behavior an animal shows evidence of learning, it has psychological experience. The ability to learn has also been proposed as a criterion by other writers, but although Loeb would deny psychological experience to all animals that do not have associative memory, other authors have perceived that this does not necessarily follow. Negatively, therefore, the criterion is of no value.

[4] J. Loeb, *Comparative Physiology of the Brain and Comparative Psychology*, 1900, 12 f.

On the positive side, Washburn has shown that the rate of learning cannot be ignored. No organism, however low in the scale it may be, has, according to Yerkes, "thus far been proved incapable of profiting by experience"; but if the rate of learning is slow enough we approach a kind of modification or change in behavior which may be paralleled in the inanimate world. "The wood of a violin," Washburn writes, "reacts differently to the vibrations of the strings after it has 'experienced' them for ten years; the molecules of the wood have gradually taken on an altered arrangement. A steel rail reacts differently to the pounding of wheels after that process has been long continued; it may snap under the strain. Shall we say that the violin and the rail have learned by individual experience?" [5] Similar changes also take place in living organisms; muscular activity, for example, may with practice become more efficient without any evidence of conscious memory. Washburn concludes, therefore, that "proof of the existence of mind can be derived from animal learning by experience, only if the learning is very rapid."

There is, therefore, no one criterion which can serve as a mark of psychological experience in animals. In view of our earlier discussion of the logical basis of animal psychology the search for criteria like these is, however, quite unnecessary. The problem is not to

[5] M. F. Washburn, *op. cit.*, 29.

find a criterion by means of which we may decide whether some animals have, and others do not have, psychological experience; we have assumed from the beginning that all animals have some psychological experience. The question is rather: What, in the concrete case, may we infer from the behavior of the animal as regards the particular kind of psychological experience which is to be correlated with that behavior? In this sense also there is no single criterion; response to a stimulus, discrimination of stimuli, variability of response, ability to learn, and even the total behavior of an animal in a particular situation may serve as evidence but only as partial evidence of psychological experience. From what has been said in the two previous chapters it should be apparent that the ascription of a particular kind of psychological experience to any animal must be made with caution and in view of a wide range of knowledge. We must rid ourselves of all egocentric and religious prejudices, we should be on our guard against naïve anthropomorphism, we should have intimate knowledge of the human mind, and we must know not only the bodily structure and innate tendencies of the species to which the individual belongs but also the 'individuality' of the animal itself. We should, furthermore, so conduct our observations as to permit a safe generalization of the behavior of the animal in a particular situation; and then, with our logical presuppositions clearly in mind, we may draw our inferences.

69. Types of interpretation. The interpretations which have been made in animal psychology may conveniently be grouped under four heads: Simple Responses, Instinct, Learning, and Insight. The significance of the problems involved under each of these captions varies according to the psychological point of view from which the inferences are made, and consequently we shall, henceforth, have to keep these points of view in mind.

From the existential point of view response to, or the discrimination of, simple stimuli points to the quality and the relative intensity and duration of the animal's experience. The responses have always to be considered, however, in connection with the morphology of the individual. Infusoria, for example, 'respond' to differences in temperature, to differences between a chemical stimulus and the surrounding medium, to light, and to mechanical pressure. But since these animals have no sense organs we cannot infer that they have the variety of qualitative experience which the human individual would have in the presence of the same stimuli. Vertebrates, on the other hand, which have sense organs similar to our own may have modes of experience, *e. g.*, sight, sound, taste, resembling our own; but the particular qualities within a mode can be inferred only from the results of experiment. The nature of the animal's experience in the discrimination of form, objects, and the like, is more difficult to determine. Differences are undoubtedly

discriminated, but it begins to appear that no animal below the ape has perceptual patterns like our own; his seem to correspond to the total situation rather than to particular objects within the situation. A spider, for example, will not respond to a fly as such, but to a *fly-on-its-web;* all of the spider's characteristic behavior in attacking its prey caught on the web, can be induced by suitable variations of the vibrations of tuning forks brought into contact with the web. If, on the other hand, a fly is placed directly in front of or beside the spider it will not be attacked.

Those psychologies, on the other hand, that regard consciousness, in whole or in part, as subject matter of psychology must, from these simple types of response, infer that the animal not only has particular qualities of experience but also is aware of them. When, moreover, an animal, by the preference method, discriminates between stimuli it is sometimes inferred that the animal chooses, *i. e.*, that it consciously selects, and voluntarily moves towards, a stimulus. When, again, the animal makes a response that may be regarded as adaptive, it may be inferred that the animal displays conscious purpose.

Finally, from the behavioristic point of view, a response to a stimulus is regarded as a unit of behavior and is explained physiologically. In the classification of responses inferences are made as regards their innate or acquired character. The salivary reflex is, for instance, classified as an explicit hereditary re-

sponse, whereas a conditioned reflex, as obtained in the Pavlov experiment, is called an 'explicit habit response'.

The term 'instinct' we shall employ to include all innate tendencies. The term was formerly a concept invented to explain the behavior of animals to whom the faculty of reason was denied. In animal psychology it has come to mean, in general, a combination of innate tendencies which, under proper stimulation, unfold in serial order; they differ from habits only in the sense that they are innate, whereas habits are acquired. Since, however, some behavior which is interpreted as instinctive does not appear at birth, or may be modified by experience, and since habits derive, in part at least, from instinctive tendencies, it is often impossible to draw a clear line of demarcation between instinct and habit. In behavioristic psychology, all animal behavior is both described and explained in terms of hereditary responses and habits. In the 'consciousness psychologies' both instincts and habits are explanatory; whenever the behavior of an animal cannot be explained by conscious processes, recourse is had to the one or the other of these two categories. The criterion for distinguishing instinctive and conscious processes is the degree of variability of response. Much of the complex behavior of the social insects is, for instance, said to be instinctive largely because it shows little variability, it lacks the plasticity of 'conscious behavior'. Those

psychologists, on the other hand, who argue for a higher degree of consciousness in these animals, insist that their behavior shows more variability than is commonly supposed. In existential psychology, instincts are regarded as biological, but as correlated with some psychological experience.

The problem of learning, in the animal, as in the human individual, belongs to empirical psychology. In existential psychology, it is true, inferences may be drawn from the empirical data; as, for example, whether or not the animal shows any evidence of imagery or of idea in the existential sense; but learning, which involves body and mind in use, is itself a problem of empirical psychology. In behavioristic psychology, learning is largely a matter of habit formation; and in the consciousness and functional psychologies, the kind and rate of learning is taken as indicative not only of certain conscious processes but also of the degree of intelligence of the animal. Until recently, animal psychologies have generally accepted the notion that animals overcome both natural and artificial obstacles in situations, by what is commonly called 'the method of trial and error'. This phrase, which originally belonged to mathematics, seems to have been introduced into animal psychology by Lloyd Morgan, and it implies a characteristic form of behavior. The animal, when placed in a situation in which it must surmount an obstacle, is said to respond by a series of instinctive acts until one is found

that is successful. 'Trial and error' is now employed, however, in two slightly different senses. Jennings uses the phrase to characterize the method of certain infusoria in avoiding natural objects. In such cases there is no indubitable evidence of learning; when the animal, at different times, faces the same situation, it repeats the same program of activities in approximately the same order until the obstacle is overcome.[6] Thorndike, on the other hand, employs a similar phrase 'Trial and accidental success' to characterize the way in which animals higher in the scale learn to surmount the same obstacle in successive situations. In these cases the errors, *i. e.*, the unsuccessful movements are gradually eliminated in successive trials, until the animal responds at once with the successful movement. The method implies a chance selection of instinctive tendencies and a 'stamping in', by repetition, of the successful act in such fashion that, eventually, it alone is reproducible. Thorndike regards the method as the typical, if not the only way, in which an animal learns, and to explain it he has evolved a theory which has been extended even to human learning. The nature of the results of experiments in which animals learn by the method, have led him to conclude that, although animals of the same and different species show different degrees of intelligence, they show no signs of thought. "There

[6] H. S. Jennings, *Contributions to the Study of the Behavior of the Lower Organisms*, 1904, 237 ff.

is," he says, "no reasoning, no process of inference or comparison; there is no thinking about things, no putting two and two together; there are no ideas—the animal does not think of the box or of the food or of the act he has before him."[7] The trial-and-error method has recently been criticized by Köhler. The artificial situations employed in Thorndike's experiments were such that the animal had no opportunity to make use of ideas if he had them, the obstacles which the animal had to overcome were not completely visible; and the test situation was such that it could in no way serve as guide to the animal's movement. The method of trial and error, as a method of learning, is undoubtedly employed both by animals and by human individuals in certain situations; but Thorndike has evidently gone too far in generalizing his results to include all animal learning.

The results of Köhler's method, which in the previous chapter we called the 'insight method' (see p. 197 f.), have been interpreted by him as showing insight by the animal into the difficulty of the situation. The situation containing the obstacle was so arranged that the animal could, without turning its head, comprehend the whole of it, and the solution of the problem required the use of means which were familiar to the animal. His most successful experiments were with apes, and his inferences were drawn from the total behavior of the animal at the moment

[7] E. L. Thorndike, *Animal Intelligence*, 1911, 20 ff., 118 ff., 241 ff.

when the solution was found. The chief characteristic of this behavior was the suddenness of its inception. After unsuccessful natural trials as, for example, reaching through the bars of its cage for food which was beyond reach, the animal frequently made no attempt at all for an interval, and then suddenly made the movement which overcame the obstacle. The results of these experiments may be characterized as 'achievements' rather than as learning in the trial-and-error sense. Nevertheless when, in subsequent trials, the animal met the same situation he usually responded at once with the successful act. Köhler has not yet given us a theory of 'insight', but the results of his experiment point toward a wide extension of our conception of the psychological experience of at least the higher animals. Köhler's views have also been extended and generalized for educational theory, by Koffka and Ogden.

Supplementary Readings for Chapter XI

Paragraph

67. M. F. Washburn, *op. cit.*, 22 ff.; G. Kafka, *Einführung in die Tierpsychologie*, 1914, 8 ff.; J. W. F. Cooley, *The Principles of Science*, 1912, 48 ff.

68. Wm. James, *Principles of Psychology*, ii, 1890, 348; J. Loeb, *Forced Movements, Tropisms, and Animal Conduct*, 1918; E. Claparède, "La psychologie comparée; est elle légitime?" in *Arch. de Psychol.*, v, 1906, 15 ff.; R. M. Yerkes, "Animal Psychology and the Criterion of the Psychic," *Jour. Phil. Psychol. and Sci. Methods*, ii, 1905, 141; Wm. McDougall, *Outline of Psychology*, 1923, 43 ff.

69. W. Köhler, *The Mentality of Apes*, transl. by E. Winter, 1925; S. J. Holmes, *op. cit.*, 235 ff.; J. B. Watson, *An Introduction to Comparative Psychology*, 1914, 31 ff., 45 ff., 112, 184 ff.; *Psychology from the Standpoint of a Behaviorist*, 1919, 194 ff.; E. Raband, "Recherches expérimentales sur le comportement des diverses araignées," in *L'Année Psychologique*, xxii, 1920–21, 21 ff.; K. Koffka, *The Growth of the Mind*, transl. by R. M. Ogden, 1925; R. M. Ogden, *Psychology and Education*, 1926.

CHAPTER XII

MENTAL DEVELOPMENT IN THE ANIMAL SERIES

If the developed nervous systems of [the most elevated] creatures have gained their complex structures and functions little by little; then, necessarily, the involved forms of consciousness which are the correlates of these complex structures and functions must have arisen by degrees. And as it is impossible truly to comprehend the organization of the body in general, or of the nervous system in particular, without tracing its successive stages of complication; so it must be impossible to comprehend mental organization without similarly tracing its stages.— HERBERT SPENCER.

70. Genetic psychology. Thus far in our discussion of the special psychologies, we have regarded psychological experience as distributive. The psychology of individual differences, of the abnormal, and of the animal have all had a distributive relation to general psychology. We now turn to another, to the genetic point of view. We have seen that the animal series, biologically regarded, ranges from the unicellular animal at one extreme to the human organism at the other. Animals which lie at points between these two extremes differ in complexity of structure and in range and specificity of biological function. Since

we have extended the law of continuity to include psychological experience, we may also regard the mind of the human individual, together with that of animals which lie below him in the scale, as products of development. The series may, therefore, be regarded as a genetic series. The study of psychological experience from this point of view, is generally called 'genetic psychology'; and it includes the development of mind not only in the animal series and in the history of the human race, but also in the growth of the individual; biology includes the two former under the term phylogeny or phylogenesis, and the latter under ontogeny or ontogenesis. In this chapter we shall limit our study to development in the animal series, but first we shall have to face several problems which are fundamental to the concept of mental development at large.

In the early days of the theory of evolution the possibility of the correlative development of mind and nervous system was taken, more or less, for granted. Mind was considered solely in the sense of faculty or activity and the various mental faculties were regarded as forming an hierarchy in complexity. Simple perception and 'perceptual inference' was the lowest form of reason, and behavior that showed a preference for one of two stimuli, or an active choice, was said to be the beginning of conation or will. The various stages of complexity of mental function were, as Spencer says, considered as correlative with stages

in complexity of biological structures and functions. This was also the view of Darwin, who, as Carter has shown, had only a popular conception of mind. Romanes, on the other hand, limited mental evolution to the various types of ideation from percept to 'higher concept', and to this progression he gave the general term 'intelligence'. Since the experimental period of animal psychology began, mental development has meant almost exclusively the growth of intelligence, and intelligence has meant "the capacity to select impulses", "the number, speed of formation, permanence, delicacy and complexity of associations possible for an animal" (Thorndike); or organizing power; the adjusting of 'means to ends', and the correlation of "a simple action with its immediate result" (Hobhouse); or again, "all those forms of profiting by experience through the formation of associations" (Holmes). Baldwin, it is true, avoids the term 'intelligence', but characterizes mental development as the formation of *habits*, the "maintenance of advantageous situations by the organism's own movements" and the formation of *accommodations*, the development of 'new adaptions' which involve the breaking up or modification of habits. All of these views, and they are representative, derive from the conception of mind in use, they belong to empirical psychology.

The concept of development has, apparently, not been touched by the behaviorist. We must suppose,

however, that for him, development consists in the increase in the number and complexity of hereditary tendencies or responses, and in the increased possibility of the formation of habits; that is to say, the development of behavior parallels the development of nervous system and effectors.

For existential psychology, development can mean only a multiplication of qualitative experience, a possible increase in the range of intensity, duration and clearness, the acquisition of imagery, and an increase in the number and complexity of the integrations of psychological experience.

A second problem derives from the nature of the biological series. This series is not, in fact, a straight line. "Organic evolution," Thomson writes, "is a continuous, natural process of racial change in a definite direction, whereby distinctively new individualities arise, take root, and flourish, sometimes alongside of, and sometimes, sooner or later, in place of the originative stock. . . . In many cases, the ancestral stocks are unknown; in other cases where they have been detected by some probability, they are separated by great gaps from their modern descendants."[1] This means that the various species lie not in a linear series but upon branches which extend a greater or less distance from what we may regard, ideally, as a linear series. It is impossible, for example, to think of a dog as ultimately developing

[1] J. A. Thomson, *The System of Animate Nature*, ii, 1920, 360.

into anything like a human creature. The result is that instead of a continuous series in which one form or stage grows out of a preceding form or stage we have a series of stages in development which are only remotely connected. It also happens that, psychologically regarded, animals which vary greatly in form and in the nature of their innate tendencies, may be on approximately the same level of psychological development.

A third problem concerns the mechanism of development. In the animal series development is based upon the laws of heredity, and these laws, as we know them, are biological. Is there, then, mental inheritance? The term is frequently employed; but no one supposes that mental traits may be inherited without also the inheritance of physiological processes correlated with them. It sometimes happens that it is easier to measure statistically the appearance of a trait in psychological than in physiological terms. Red-green color-blindness and a form of night-blindness may both be transmitted by known laws of heredity. A form of epilepsy known as Huntington's chorea and a type of feeble-mindedness may also be transmitted from one generation to another, but in all those cases we must suppose that a particular combination of neural processes or tendencies are also inherited. The laws of mental inheritance, then, are also the laws of biological inheritance. In connection with these laws there are many serious prob-

lems with which biology is concerned, but which we shall have to ignore.

71. The course of development from the empirical point of view. It may be well, at this point, to give the general consensus of opinion concerning the psychological development in the animal series. We shall have to deal with groups of animals which are similar in neural and somatic development, and commencing with the simplest group, we shall work by groups up the scale. The result, then, will be different stages of psychological development. It should not be forgotten, however, that in any one group, the individual animals vary markedly both biologically and psychologically, and that a conclusion may be drawn for the group that may not hold for some particular animal in it. It should be remembered, also, that at the present state of our knowledge it is impossible to speak with anything like finality as regards the psychological status of any particular animal; all inferences must, therefore, be regarded as provisional and subject to change with future investigations.

The unicellular animal responds as a whole. Its reactions can scarcely be regarded even as reflexes, because the effect of the stimulus is not restricted to the point of stimulation but spreads to the whole organism. It can hardly have more than two or three qualitative experiences, perhaps also vague pleasantness and un-

pleasantness, an organic memory of brief duration and, as Thomson suggests, a kind of curiosity which is evidenced by its "simple searchings and probings" for food. It may have, also, a beginning of learning, as seen in the kind of 'trial and error' which Jennings has reported. Finally, some animals in this group show a persistence which, it has been suggested, may be the beginnings of endeavor or conation.

In the next stage, that of the simpler multicellular animals, like hydras, starfishes, sea anemones, and jellyfishes, there is a continuation of all the processes noted in the previous group, but with marked advancement. The appearance of sense organs and of nervous connections between sense organ and effector, make possible a fixed and uniform response of a part of the animal to a particular stimulus; that is to say, reflex action. Some of the reflexes that appear at this stage may improve with practice, and some may develop in the individual's lifetime. We find, then, a greater variability in response, definite evidence of learning, a clearer differentiation of sensory experience, perhaps an increase in effective or emotional experience, and the first evidence of 'choice' and purpose. Yerkes thinks that also "certain evidences of imagery, lacking, perhaps, the element of recognition or the feeling of familiarity, are discoverable." [2] The ability to learn is sometimes in-

[2] R. M. Yerkes, *Introduction to Psychology*, 1911, 228 ff.

terpreted as the beginning of inference on the part of the animal. It is, Thomson says, "the dawn of intelligence, and may be illustrated by cases like the following: A young octopus trying to capture a hermit crab is stung by the sea anemone which is the crustacean's partner. It avoids further encounter. Old octopuses, however, learn to extract the hermit crab without touching the sea anemone." [3]

The next group comprises the insects. They have a further developed brain and a complex bodily structure which permit a more complex system of connections between sense organ and effector; and consequently the possibility of a wider range and combination of innate tendencies. The characteristic behavior of these animals as compared with the former group, consists in a greater variety of movements and a complex colonial life. This life is, for the most part, instinctive in the technical sense. The animal's gross bodily structure and innate tendencies determine their complicated action-patterns. They also show, however, evidence of intelligent behavior; they overcome obstacles and they profit, to some extent, by experience. Certain sensory experiences play a large part in their activities, the most important of which are smell and touch. They seem also to possess some emotional experience; Wheeler, who has devoted his life to the study of ants, says "In my opinion they

[3] J. A. Thomson, *op. cit.*, 513.

experience both anger and fear, both affection and aversion, elation and depression in a simple 'blind' form; that is, without anything like the complex psychical accompaniment which these emotions arouse in us." [4] Yerkes thinks that the social insects have developed in a direction which has led to a position far removed from that of man, but to one not necessarily lower in the scale. It is as if the ancestral tree divided into two main branches with the insects at the top of one branch and man at the top of the other.

The lower vertebrates, the fishes, frogs, toads, reptiles, and birds, lie somewhere between the two main stems and at a level not far above the simple multicellular organisms. There is, however, a wide range of difference within the group. Reptiles and birds are distinctly higher in development than fishes, frogs, and toads. Birds, in particular, have visual experience similar to that of the human individual, and in the building of nests and care of young show instinctive tendencies not far removed from those of the insects. Birds, also, reveal a learning ability considerably greater than that of other lower vertebrates and of the insects. It is possible, also, that in some birds at least, there is a beginning of what has been called 'insight'.

In the higher vertebrates we find animals whose

[4] W. M. Wheeler, *Ants, Their Structure, Development and Behavior*, 1910.

nervous systems and bodies are becoming structurally more similar to our own. Their psychological experience is also more like that of the human individual; they have, apparently, the same modes of sensory experience, but a different and an unequal distribution of sensory qualities. Each species has instinctive tendencies peculiar to itself, but all animals in the group are able quickly to form new habits, and to meet new situations with 'insight'; it seems probable, however, that the insight or 'understanding' at this level occurs without the presence of images or ideas.

In the last stage below man, that of the higher primates, there appears, apparently for the first time, the beginnings of imagery, and with it of memory (in the conscious sense), and perhaps of imagination. The more intelligent of these animals seem to attempt the solution of their problems with a definite plan or idea of means to end. Their inferences are, however, largely of the perceptual kind, and they seem unable to form conceptual ideas. It is this latter ability which is the special prerogative of man.

We may recapitulate and summarize, by tracing two lines of descent. The first, which we may call the line of behavior, begins (1) with the simple response to stimulus which, because the whole animal is involved, Thomson calls 'organic reactions'. (2) With the beginning of a nervous system, the next step is the simple reflex. (3) As the nervous system becomes

more highly integrated, instincts appear, and (4) corresponding to the development of the cortex and the increase of its motor and sensory areas, there is a greater possibility of the modification of instincts and the formation of habits. The second line, which is generally called the line of intelligence, begins (1) with the variability of response which we find in the lowest organism. (2) The first sign of preference or choice, which is in part awareness and in part volitional. (3) At the stage of the reflexes, a " coördination of acts toward a definite result ". (4) The beginning of 'perceptual inference' in learning. (5) A progressive increase in the ability to profit by experience, *i. e.*, of organic memory and perceptual inference. (6) The beginning of understanding or insight, which is correlated with the emergence of the free idea. It will be noted that 'intelligence' includes both cognitive and volitional activities; it should, also, perhaps include pleasantness and unpleasantness, particularly in the lower stages. Intelligence, therefore, is a general functional term which includes all of the traditional activities, with varying emphasis at different stages of its growth.

In separating development into two distinct lines, we have anticipated the answer to a question which has puzzled many students of genetic psychology. Since the instinctive tendencies, at their highest development, are said to show purposive plan of high degree—which, however, is regarded as 'blind',

i. e., without conscious purpose—it has been argued that either intelligence must have preceded instinct and that the latter appears as a mechanized or fossilized intelligence; or else that instinct has developed under the influence of natural selection and that intelligence has developed from instinct. To debate this issue here would not be profitable. The issue derives, in part, from biological considerations, and in part from a confusion of biological and psychological processes. If intelligence is regarded as the ability to form habits, then naturally, it may take its rise in reflex or instinctive tendencies. If, on the other hand, intelligence is regarded as conscious design or purpose, then it could not take its origin in instincts in so far as they are unconscious. As a matter of fact, the two sets of processes must develop side by side. Instinct and intelligence occur together, but in greater or less proportion, in every animal.

72. The development of existential experience. There is another line of development which should be considered briefly, namely, the successive multiplication of sensory modes and qualities which are correlated with the progressive differentiation and development of sense organs.

In the unicellular animals, as we have said, we can posit no more than two or three sensory qualities resembling pressure or contact. With the beginning of the nervous system, there appears first, a localiza-

tion of sensitivity; for example, touch in tentacles or in the anterior portions of the body. There also develop what are called 'distance receptors'; the animal no longer must always be in immediate contact with the stimulus object; water-dwelling animals are able to detect food at a distance; flatworms and starfish will turn in the direction of food even though they are not in contact with it. These reactions to food are sometimes called 'chemical senses' because the stimuli are chemical and because it is impossible at first, to differentiate taste and smell. There is some evidence, however, that taste proper is found in the earthworm and smell in the starfish. The beginning of visual experience is probably coincident with the appearance of pigment spots which, as in the volvox, are sensitive to light stimuli. Audition is, apparently, the latest of the senses to appear; in the lower animals atmospheric vibrations are apparently felt and not heard.

Further development of sense organ and sensory experience is conditioned largely upon the environment in which the animal lives. Smell is perfected in those animals that live in the air and near the ground; birds that live in trees have little smell but develop sight and perhaps hearing.

The differentiation of modes of experience into various qualities also increases as we ascend the scale, but it increases irregularly in different species. Birds and dogs, for instance, have eyes structurally similar

to the human eye, but the range of their qualitative visual experience is quite different; barnyard fowls seem to experience all the colors of the spectrum, whereas the dog is nearly, if not quite, color-blind. The course of development of visual qualities seems to have been first gray, white, and black; then, to these were added first blue and yellow of different tints and chromas (saturations); and finally, red and green which form intermediates with blues, yellows, blacks, whites, and grays, and thus give the world of vision like that of man.

Imagery, as we have already seen, does not appear below the primates, and then is probably visual in quality. It is, of course, possible that animals like the dog, which live predominantly in a world of smell, may possess olfactory imagery, but evidence for it has not yet been found. Auditory imagery probably occurred late in the human individual.

Little can be said, as yet, about the development of qualitative patterns underlying the apprehension of form and space or other complex experiences of animals.

Supplementary Readings for Chapter XII

Paragraph

70. H. Spencer, *Principles of Psychology*, i, 1870, 291 f.; M. H. Carter, "Darwin's Idea of Mental Development," in *Amer. Jour. Psychol.*, ix, 1898, 534 ff.; "Romanes' Idea of Mental Development," *op. cit.*, xi, 1899, 101 ff.; J. M. Baldwin, *Mental Development in the Child and the Race*, 1906, 1 ff., 452 f.; E. L. Thorndike, *Animal Intelligence*, 1911, 282 ff.; L. T. Hobhouse, *Mind in Evolution*, 1915, 70 ff., 174 ff.; S. J. Holmes, *The Evolution of Animal Intelligence*, 1911, 1 ff., 115 ff., 164 ff.

71. J. A. Thomson, *The System of Animate Nature*, ii, 1920, 507 ff.; *What is Man?* 1924, 75 ff.; R. M. Yerkes, *Introduction to Psychology*, 1911, 228 ff.

72. M. F. Washburn, *The Animal Mind*, 1926, 40, 70 f., 73, 105 f., 126, 155 f., 160, 295 ff.

CHAPTER XIII

PSYCHOLOGICAL DEVELOPMENT IN THE INDIVIDUAL

All the world's a stage,
And all the men and women merely players;
They have their exits and their entrances;
And one man in his time plays many parts,
His acts being seven ages.—WILLIAM SHAKESPEARE.

73. Concept and nature of individual development. The term individual development may mean (1) the individual's physical growth, the change in time in its size and form; or (2) the individual's physiological development, the change in the function and organization or integration of the various parts of the body; or, again, (3) the individual's psychological development, the change in mental activity, or behavior, or performance, or in existential experience, according as psychology is defined. The two latter are closely related to the first of these three kinds of development. We must, therefore, inquire more closely into the nature of physical growth.

The growth of the individual is called 'physical' because it is measured in physical units, *i. e.*, in millimeters and grams. As employed in biology, growth is generally defined as an increase or decrease in size not

only of the total individual but also of any one of the various parts which constitute the organic whole. The whole individual or any constituent part of it may, therefore, grow larger or smaller. Growth is, of course, a function of time; and change in size per unit of time furnishes the measure of the rate of growth. Every part of the body has its own particular, although variable, rate of growth; some parts may for a while grow more rapidly, and then for a time more slowly than other parts. From this, two consequences follow: First, since the total rate, as measured by weight, is the average rate of the parts, the rate of growth of the total individual is variable. Secondly, since some parts grow more rapidly than others, the form of the individual must change; biological growth is not only a matter of change in size but also in form. These two factors, variability in rate and change in form, make it possible to divide the course of the individual's life into stages of the continuous course of growth. In nearly all animals the three stages of youth, adulthood, and old age are easily recognized; in youth growth is rapid, in adulthood it is slow with practically no change in size and only gradual change in form; in old age the body gradually grows smaller and characteristic changes in form occur. In the lifetime of the human individual some writers find as many as ten stages between birth and death in old age. The most frequently recognized number, however, is seven—the number that Shakespeare employed in

his caricature of the course of life in *As You Like It.* Shakespeare's stages are, however, not merely those of growth but also of function both physiological and psychological.

Physiological development is not so easy to define as is growth. It includes, of course, the mechanisms of circulation, digestion, respiration, the functions of the liver, kidneys, and spleen, all of which, in the human individual, are ready to function at birth. It includes also the functions of the nervous system, only some of which begin at birth; others must await the growth of cell and the medulation of neuronal tracts before brain organization and the integration of nerve and muscle complexes can be further developed. It is sometimes said that physiological development is in large part conditioned upon growth, and the above instances will serve as examples. In some cases, however, the converse is true; for the processes underlying growth seem to be metabolic, and the rate of growth seems curiously linked with the relative amounts of the secretions of the various ductless glands. Physiological development and physical growth are, therefore, interrelated, and we must expect to find the stages of the one corresponding to the stages of the other.

Since psychological experience, however defined, is ultimately conditioned upon the biological organism, we may expect also a close correspondence between biological and psychological development. What the

characteristic stages of the latter are we shall have later to investigate in some detail; for the present, the problem of the genetic psychology of the individual is to characterize the successive stages, to see how every one develops from the immediately preceding stage, and then to consider the laws and correlations of individual development in general.

74. Child psychology. The studies of psychological development in the individual have, thus far, been limited almost entirely to the human child. Some comparisons of the relative learning ability of young and adult animals, and observations of the course of certain instinctive activities in young animals have, it is true, been made; but little work has been done on the entire course of development in any one species. It is natural, perhaps, that investigations of individual development should begin with the human youth. For at birth it is further away from maturity, and its period of dependence is much longer than that of most animals. Furthermore, society has the problem of educating the child and of forming it to its standards, and knowledge about the development of the child is of service in solving this problem. Most of the studies of development in the individual have, in fact, been made in the interest of education and other social problems. This being the case, the individual with which we shall have to deal will be the total psychophysical organism, the individual that

we have met in our study of individual differences; and the psychological point of view is that of empirical psychology.

The methods of child psychology must be of the same nature and based upon the same application of logic as those of animal psychology. The infant, like the animal, cannot speak, and he cannot, either, for some years, take a scientific point of view toward the world of experience, and describe it. The behavior of the infant can, however, be observed, and inferences of psychological processes be drawn from it, as in animal psychology. The same precautions as regards hasty inference are also necessary, and the tendency of adults to ascribe to a child their own mature processes is especially to be avoided. Uncontrolled observation of the behavior of the infant yields, as in animal psychology, certain results which cannot be obtained in any other way. In child psychology it has assumed a systematic form, and is called 'the diary method'. This method consists in a daily record of the child's natural behavior, together with the results of occasional experiment, and it is thus far the only method for the study of the course of development in particular individuals. Another form of the uncontrolled experiment, known as the 'questionary method', was employed on a large scale by Stanley Hall and his students. A list of questions was prepared and sent to a number of individuals (parents, relatives, and nurses of children), who were asked to observe and to

report particular forms of behavior as called for by the questions. The results obtained by this method are of doubtful value, principally because the observers were not trained clearly to distinguish actual occurrences and personal interpretations. Of recent years, there has been a growing tendency to employ the methods of controlled observation; the discrimination experiments, the preference method, the Pavlov method, and the detour or 'insight' method familiar in Animal Psychology, have all been adapted to children. Finally, the mental test has been extended for use with infants and should, if successful, furnish a basis for statistical results that shall serve as supplement to the investigations of individual children.

The results of investigations by these methods are, of course, arranged in a chronological series which begins with birth. We must, however, first know the psychophysical equipment of the infant at birth. On the side of physical growth, then, it should be noted that the infant is not an adult in miniature; on the contrary, the relative size and function of its bones, muscles, vital organs, and nervous system are vastly different from those of the mature individual. For example, the bones in some parts of the body are, at birth, not completely formed and are extremely pliable. As compared with the adult, the infant's legs are shorter, its trunk longer and its head larger than they should be. Before it is fully grown, the infant must increase its height threefold and its weight eighteen

to twentyfold. The brain of the infant, at birth, has all the cells it will ever have, and it has attained approximately a fourth of its adult weight. The rate and relative amount of the child's physical growth will not, therefore, be uniform in all its parts.

On the psychological side, the infant at birth, or shortly thereafter, has all modes of sensory experience, the simple feelings—pleasantness and unpleasantness; the innate tendencies for the arousal of fear, anger, and love; and finally, a number of reflex and instinctive movements.

Physical growth begins within two or three days. As regards height, there is a rapid increase during the first year, then a decrease in rate until about the age of six or seven; at the latter time, there is, for a short period, an increase in rate which again decreases until about the twelfth year; between the twelfth and fifteenth years there is, once more, an increase and following this period again a decrease in rate which becomes slower and slower until maturity is reached.

It will be observed that there are three distinct points at which a period of rapid growth is followed by one of slower growth, *i. e.*, at six or seven, at twelve, and again at fifteen years. Corresponding to these there are other marked stages of physical growth; the brain has almost reached its adult weight by the sixth or seventh year, and also at this time the first permanent teeth appear. By the age of twelve all of the permanent teeth are present except the third

molars, and at fifteen years puberty has begun. These results are, of course, averages and are subject to variations according to the race, sex, and general metabolism of the individual. There are also correlative stages of psychological development. The period of infancy comprises the first six years, that of childhood the next six years, then follows the period of adolescence which continues until maturity and is sometimes divided into two periods—the one just before, and the other after, puberty.

Most of the problems of development arise in the first period. As it is the stage of most rapid physical growth, so also is it that of greatest mental growth. The problems themselves fall into five groups. The first concerns the development of muscular coördination and control. The course of this development begins with those tendencies to bodily movements which are innate, but which require 'practice' for their complete coördination, such as, for example, the movements of the eyes as they converge upon or follow objects, and coördinations of the grosser muscles which have their beginning in aimless movements of the arms and legs, and end in the ability to handle objects and to walk. The second group deals with the origin and development of instinctive tendencies, such as imitation and play. The third set of problems consists in the observation of the beginning and the subsequent course of the gross psychological functions, such as perception, attention, memory,

imagination, will, and intelligent learning. All of these problems involve, in one way or another, the general question of meaning. It was formerly supposed that the beginning of the child's psychological life was meaningless. James, for example, says: "The baby, assailed by eyes, ears, nose, skin and entrails at once, feels it all as one great, blooming, buzzing confusion". At the present time psychologists are generally agreed that some, although not necessarily conscious, meaning is present from the first; experience is not a "buzzing confusion", but something in experience—a sight, a sound, a pain, a hunger—stands forth more or less clearly from the rest as a background or context, and we thus have a pattern that is adequate for meaning. The fourth group of problems includes the study of the development of speech, which begins with the baby's babble of the first few months and ends about the fourth or fifth year in a speech adequate to the child's needs for communication. The final group of problems relates to the course of general intelligence, which is measured in terms of accomplishment by the intelligence tests.

The problems of the second period (six to twelve years) are technological rather than psychological. At the beginning of the period, the child is able to walk and talk, he has acquired all movements of the coarser kind, and all mental functions except the higher processes of thought. The period, therefore, is

one in which development consists in the acquisition of new movement-patterns and of acquiring knowledge and control. "It is," as Sanford says, "the time when society seizes upon the boy and forces him to learn the indispensable conventions of modern life, reading, writing, and ciphering." Intelligence continues to develop, and the child acquires some understanding of the meaning of such abstract terms as justice and injustice, right and wrong, truth and untruth.

The third period, which begins at twelve or fourteen years and ends with maturity at twenty to twenty-four years, is ushered in, as we have said, with a period of rapid physical growth in height, and also by the incipient functioning of the sexual glands. The secretions of the interstitial cells of the sexual glands are accompanied by the appearance of the secondary sexual characters such as the fall in pitch of the voice, the starting of the growth of hair on the body, and of the change in form of the body in the direction of that of the adult. The period begins and ends earlier with girls than with boys, and in warmer than in colder climates. The problems of the period concern, therefore, the development of the sexual instinct and of its psychological correlates. As regards the latter, there is the beginning of the awareness of the social self, when the individual becomes aware not only of his relations to the opposite sex but also to society at large, and this is accompanied

by altruistic emotions, feelings of independence, and other characteristics.

Since the investigations of individual development have, for the most part, been in the interest of education, there is little that can be said definitely concerning the development of existential experience in the individual. We have observed that the infant has all modes of experience at birth, but in how far it distinguishes qualities within a mode is not known. There is some evidence that imagery first appears at the age of two or three years. There are also facts which point to a particular type of imagery in the child, known technically as the 'eidetic' image. It appears in late childhood or early adolescence, in character it lies midway between the after-image and the free image of memory, and is so vivid that its objects are often mistaken for those of perception. The recent extension of experimental methods in child psychology should result in an increase of knowledge in this field.

75. Theories of development in the individual. The nature of development in the individual is still in the stage of theory, and the theories themselves are, naturally, conceived from particularly psychological points of view. Almost without exception, these points of view center about the notion of mind as useful and as capable of cultivation. The problems that arise concern, therefore, the nature of the child's

original endowment, the way in which it first sees the world, and the steps by which it gradually learns. The theories themselves fall into two groups.

The first relates to the relative importance in development of the two factors, inheritance and environment. Those who hold that development is, in its essence, an unfolding of inborn tendencies—the 'nativists' as Stern, by an extension of a term which originally belonged to the theory of knowledge, calls them—base their arguments upon the laws of heredity, upon the facts of individual differences, the emergence and persistence of special abilities, and the like. The 'empiricists', on the other hand, who insist that development is based upon experience, support their view by pointing to individual differences in attainment which result from different social and educational opportunities. At the present time, the difference between these theories is largely a matter of emphasis; other students of individual development regard both influences as mutually effective. "Psychic development", writes Stern, "is not simply the gradual appearance of inborn qualities, nor a simple acceptance and response to outside influences, but the result of a 'convergence' between inner qualities and outer conditions of development . . . it is never permissible to ask of any function or quality: 'Does this come from within or without?' but rather: 'How much of this comes from within and how much from without?' Both of these influences always share

in its making, only varying in degree at different times."[1]

The other group of theories relates to the course of development. Stern, for example, conceives of the individual as a total personality which must be considered as a whole. "ALL DIVISIONS INSIDE THE PERSONALITY ARE RELATIVE ONLY, MERE ABSTRACTIONS—which, however, are requisite for certain purposes of consideration and treatment—ALL DEVELOPMENT OF SINGLE FUNCTIONS IS UNFAILINGLY DEPENDENT ON THE DEVELOPMENT OF THE WHOLE."[2] Every personality furthermore has, as inborn tendencies, the impulses of self-preservation and self-development. The object of the former is "to maintain life, to hold fast what has been achieved"; the aim of the latter is to raise the standard of existence. These two tendencies unite and blend in the process of growth. The direction of development is conditioned upon a principle which he calls "development from the circumference to the center"; that is to say, "at first we find development of such activities as are immediately connected with development taking place at the circumference; and only later, development of those in which consciousness frees itself from its direct and intimate connection with the outside world, and wins, for itself, an ever-increasing measure of independence."

[1] W. Stern, *Psychology of Early Childhood up to the Sixth Year of Age*, transl. by A. Barwell, 1924, 50 ff.

[2] W. Stern, *Ibid.*, 52.

Bühler, to take another example, has three stages of development: instinct, which represents the capacities acquired by inheritance and ready for use without training; training, which makes use of associative memory in developing new dispositions and so suppressing some instinctive tendency. The third stage is intellect; it has the capacity to make discoveries by insight and deliberation, and it acquires aids of various kinds for the accomplishment of actions different from those gained either by instinct or by learning. These three stages are, apparently, heterogeneous; there is no clear way by which the earlier develop into the later stages. Intellect, in particular, seems to be quite separate from instinct and learning.

This difficulty Koffka has attempted to meet by supplying a single principle which he calls 'configuration' and which plays a uniform rôle in the explanation of instinct, habit, and intelligence. By this principle every action, whether it be instinctive, acquired, or an achievement by 'insight' or 'intelligence', is a pattern. An instinctive act, for example, is not a chain of reflexes unfolding in serial order, but it is a total pattern of activities directed towards a particular end; habits also have a definite goal; and an intelligent act is one in which the goal and the means of attaining it constitute a conscious patterned whole. "The nature of mental development . . . is not the bringing together of several elements, but the arousal and perfection of more and more complicated configu-

rations in which both the phenomena of consciousness and the functions of the organism go hand in hand." [3]

76. Relation between the phylogenetic and the ontogenetic series. Since mental development in both the animal series and the individual, is correlated with development of the nervous system, it may be that the development of the nervous system in the individual is similar to that in the race, and that the course of psychological development in the individual is also like that in the animal series. This possibility is one of considerable interest and has been the subject of wide discussion.

On the biological side the animal series begins with no nervous system at all and ends with an extraordinarily complex and highly integrated structure dominated by the cerebrum. In the human individual, we should, in order to find a corresponding course of development, have to commence with the fertilized egg and trace the growth of the nervous system through the embryo and the life of the organism after birth until the nervous system is fully developed.

On the psychological side, genetic development begins in the animal series with the single-celled animal, and parallels the development of the nervous system until the end of the biological series is reached in the human brain. In the human individual, on the other hand, psychological development begins with the

[3] K. Koffka, *The Growth of the Mind*, 1925, 230 ff., 356.

birth of the individual, when the nervous system has already reached a high stage of development. The human baby is a vertebrate and therefore high up in the animal series, and it is, also, a vertebrate with a human brain, a brain that has all of the cells it will ever have, and that has, as we have already seen, attained about one-fourth of its adult weight. The result is that, in the human individual, the course of development should begin at a much higher level than it does in the race. Since, however, the infant also comes into the world with a number of innate tendencies inherited from his ancestors, some of whom doubtless reach far back in the phylogenetic series, it would be strange if the individual did not recapitulate, in part at least, the history of the race.

In biology there is some evidence that this is the case. The embryos of reptiles, birds, and mammals are, at certain stages of development, so similar that only an expert can distinguish them. There are, also, a number of 'vestiges' in the human body, such as gill clefts, the vermiform appendix, the coccyx, muscles for moving the ears, all of which are now non-functional in man but are functional in lower animals. Such facts as these gave rise to a theory, known as the "theory of recapitulation", which states that the individual, in its ontogenetic development, passes through a series of brief stages which represent similar, longer, stages in the development of the species to which the individual belongs. This formulation of

the theory is usually interpreted to mean that the order of events is the same in the two series. Biology now recognizes that the recapitulation is, in fact, never perfect; that in some cases a period may be much accelerated in time or not appear at all; and that the order of recapitulation does not always follow that of the phylogenetic series.

In psychology, the theory has been employed to mean that not only psychological experiences of earlier animal stages but also those of the early stages of human society, recur in the same order in the individual. G. Stanley Hall, for example, supposes that such things as the fear of falling and of darkness, which are characteristic of some young children, are atavistic influences which date from the tree-dwelling stages of their ancestors. He also supposes that the boy in his development, relives the hunting, cave-dwelling and pastoral stages through which primitive man is supposed to have passed. Many of the analogies found in support of the theory are fanciful, but a rough resemblance between the two series actually may be found. There are, however, as in biology, accelerations, lapses, and displacements of serial order.

The fact that the order of occurrences in the two series is often different, has led to a critique of the recapitulation theory by Thorndike and a restatement of it in terms of what he calls "the theory of utility." This theory "explains the dates of original tendencies by the same causes as account for their existence—

variation and selection." A tendency appears, either in the individual or in the race at the time when it is of greatest service in maintaining the existence of the species. "Thus, suckling, though late in the race, is early in the individual. The sex instincts, though early in the race, are very late in the individual." According to the theory, also, traits never appear suddenly, but always as the result of a preliminary course of development, and innate tendencies are not so transitory as advocates of the recapitulation theory had thought. The sex instinct, for example, does not appear suddenly at puberty, but "is found upon careful study to be gradually maturing for years", and the hunting 'instinct' in boys is, in the adult, transferred from imaginary to real animals.[4] The questionable part of Thorndike's theory is not the facts which he brings forward against the recapitulation theory, but his making utility an explanation. Claparède, while supporting the utility theory for the purpose of education, proposes, as a supplement to the theory of recapitulation, the principle of 'conformity'. "If the development of the individual recalls the development of the race, it is because living beings are all formed in accordance with regular laws, and nature employs identical means for affecting the evolution, both of the individual and the race."[5]

[4] E. L. Thorndike, *Educational Psychology*, i, 1920, 245 ff.

[5] E. Claparède, *Experimental Pedagogy and the Psychology of the Child*, transl. by M. Louch and H. Holman, 1911, 101 ff.

It remains, of course, to discover what these means are.

Supplementary Readings for Chapter XIII

Paragraph

73. C. S. Minot, *The Problem of Age, Growth and Death*, 1908, 1 ff., 86 ff.; H. H. Donaldson, *The Growth of the Brain*, 1895, 45 ff., 103 ff.; D'Arcy W. Thompson, *On Growth and Form*, 1917, 1 ff., 51 ff., 78 ff.

74. For methods in child psychology, see K. Bühler, *Die geistige Entwicklung des Kindes*, 1924, 58 ff.; W. Stern, *Psychology of Early Childhood up to the Sixth Year of Age*, transl. by A. Boswell, 1924, 35 ff.; F. Giese, "Kinder-psychologie," in *Handbuch der vergleichenden Psychologie*, i, 1922, 325 ff.; A. Gesell, *The Mental Growth of the Pre-school Child*, 1925; F. Mateer, *Child Behavior*, 1918.

For stages of development, see K. Bühler, *op. cit.*, 64 ff.; W. Stern, *op. cit.*, 67 ff., 171 f.; F. Giese, *op. cit.*, 323 ff.; W. Woodrow, *Brightness and Dullness in Children*, 1919, 97 ff.; K. Koffka, *The Growth of the Mind*, 1925, 52 f.; G. S. Hall, *Adolescence*, 1904; M. W. Shinn, *The Biography of a Baby*, 1900; N. Norsworthy and M. T. Whitley, *The Psychology of Childhood*, 1918.

75. K. Bühler, *op. cit.*, 1 ff.; J. M. Baldwin, *Mental Development in the Child and the Race*, 1906; L. T. Hobhouse, *Mind in Evolution*, 1915.

76. A. M. Marshall, "The Recapitulation Theory," in *Biological Lectures and Addresses*, 1894, 289; J. A. Thomson, *The System of Animate Nature*, ii, 1920, 488 ff.; G. S. Hall, *op. cit.*, viii ff., 208; E. L. Thorndike, *Educational Psychology*, i, 1920, 245 ff.; E. Claparède, *Experimental Pedagogy and the Psychology of the Child*, transl. by M. Louch and H. Holman, 1911, 122, 184 ff.

CHAPTER XIV

SOCIAL PSYCHOLOGY

Driven to seek beyond the organism and its inherited aptitudes for the origin of a large portion of our mental life, we can find it only in the constitution of the Social Organism, of which we are the units. We there find the impersonal experiences of Tradition accumulating for each individual a fund of Knowledge, an instrument of Power which magnifies its existence. The experiences of many become the guide of each. . . The feelings of each are blended into a general consciousness which in turn reacts upon the individual consciousness. And this mighty impersonality is at once the product and factor of social evolution.—GEORGE HENRY LEWES.

77. The nature of social psychology. We pass now to a series of problems which result from the fact that the individual lives in social groups. The groups themselves seem to have a kind of personality: families, clans, tribes and states, religious and political organizations, or any other group which is not a mere crowd, have a unique character which serves to distinguish one from another; a people has its history, its language, its institutions, its customs and its laws. These groups are, of course, composed of individuals as the ultimate units, but these tend to lose something of their own personalities and to assume the personality of the group. Furthermore, the individual's ideas, feelings, and volitions both influence and are

influenced by the group. Finally, there are certain products, such as language, myth and religion, custom and law which, since the individual would not of himself have produced them, are social phenomena.

The study of the various collections of individuals, together with their products, constitute the subject matter of anthropology, archæology, ethnology, sociology, and social psychology. There is a great deal of confusion as regards the limits of these various disciplines, but in order to understand the specific problems of social psychology, we must risk their definitions.

The term 'anthropology', by etymological derivation, means the study of man, and in this sense it includes both the individual and the social man in all their aspects. At the present time, however, there is a tendency to limit the term to the biological man as regards his physical form and character, its development through geological periods, and the various physical types now found in different races. The word 'anthropology' is sometimes predicated by the term 'social', in which case it refers to the culture or civilization of man and may be subdivided into two parts. The first of these is archæology, which, in general, studies the physical remains of past civilizations —of their art, architecture, pottery, sculpture, monuments, inscriptions, coins, and the like. The second is ethnology, which is interested, primarily, in the culture of primitive peoples now living, as evidenced

by all their social products, which include not only objects of art, weapons, utensils, architecture, but also language, myth and religion, customs and laws. A branch of ethnology, called 'ethnography', deals with the distribution of races and cultures throughout the earth. In practice there is much overlapping between these two fields, for the archæologist can hardly escape an interest in the arts and customs of primitive societies, and the ethnologist often carries his investigations into the languages and arts of past civilizations. Sociology is, in general, confined to the form and structure of society, the organization of the social group, and the laws of its development. There is, also, an 'applied' sociology which deals with the practical problems of social organization, such as criminology, delinquency, marriage and divorce, immigration and emigration.

Social psychology bears an intimate relation to all of these fields. For, in the first place, they all tend to utilize psychology for explanation. So long as these explanations do not transcend psychological facts, psychology is not concerned; but if an explanation is offered which is contrary to psychological fact, psychology cannot ignore it. An ethnologist, for example, failing to find a word for 'blue' in the language of a primitive people, explains it by supposing that these natives do not see 'blue'. The psychologist, knowing the laws of vision and many facts concerning its genetic development, is able to show

reasons why this particular explanation is highly improbable. In the second place, all social organization and all the cultural products of society may be regarded as expressions of psychological experience. It is the psychological study of the facts discovered by anthropology, ethnology, and sociology, that constitute the subject matter of social psychology. The studies, themselves, fall into two groups according as they are directed to social products, or to social organization. Of these two, the former is the older, and we shall commence with it.

78. The genetic psychology of peoples. This division of social psychology began in the third quarter of the last century, and has a threefold origin. The first grew out of certain metaphysical doctrines of Hegel and of Humboldt. Both placed the social group above the individual, and they postulated a folk soul for the group in contrast to the individual soul. This view found a restatement, and a psychological interpretation at the hands of Lazarus, an empirical psychologist, and Steinthal, a philologist. These two men founded, in 1860, a journal which they called *Zeitschrift fur Völkerpsychologie und Sprachwissenschaft*, and which is usually regarded as marking the beginning of social psychology. The term *Völkerpsychologie* is often translated as folk psychology, or ethnic psychology, but its meaning, as now employed, is better expressed in Wundt's definition—" the ge-

netic psychology of peoples." Lazarus and Steinthal proposed two sets of problems. First, *Völkerpsychologie* proper, or the discovery of the general principles underlying the phenomena common to all social groups; secondly, psychological ethnology, or the application of these principles to a differential psychology of peoples. Their solution of these problems was an explanation of the phenomena of social groups in terms of a collective mind (*Volkgeist*). The laws of this collective mind were, however, derived from individual psychology. The new discipline was, therefore, partly ethnology and partly individual psychology.

The second root of the genetic psychology of peoples has its beginnings in the French philosopher Comte, who applied certain biological principles to the problem of society. He was followed by Spencer, who for the first time applied the principle of evolution to the development of society. At the same time, Tylor and Lubbock were publishing anthropological studies of primitive civilizations, in which they frequently employed the conceptions of English empirical psychology.

The third influence upon the subsequent development of social psychology was a number of studies of racial or national differences by Hillebrand, Didon, Fouillée, and others. These books were philosophical in character and of little scientific importance. Their value consisted, primarily, in showing the need for systematic investigation in this field.

These three movements were, finally, brought together in the *Völkerpsychologie* of Wundt. This term is now a general name for the genetic development of peoples as inferred from their products. In the study of the origin and development of language, of myth and religion, of custom and law, the origin and development of the inner life of the peoples themselves may be traced. The 'group' consists of individuals, but according to Wundt it is something more than the sum of individual minds, it is rather the synthesis of individual processes through the combination and interaction of many minds. There is, however, no substantial mind over and above that of the individual; the mental processes themselves are still individual. He furthermore regarded the genetic psychology of peoples as a supplement to general psychology. The observation of the individual is "incapable of giving us a history of the development of human thought, for it is conditioned by an earlier history concerning which it cannot, of itself, give us any knowledge." He also believed that the genetic study of the product of social groups would furnish knowledge of the higher thought processes of the individual, which could not be gained by experimental methods. Wundt's general method and result may be illustrated by reference to his treatment of language. From a study, not only of the classical languages but also of those of primitive peoples, he came to the conclusion that the most primitive

form of language was not speech but gesture. Three or four forms of natural gesture language are still extant, and from an investigation of them he concluded that, psychologically, language developed from the innate tendency to express feeling by movements, and that the first spoken words were vocal expressions of feeling. He was able, furthermore, to trace the development of gesture from a simple indicatory form in which objects and persons were merely pointed to, through imitative and plastic gestures in which movements and forms were imitated, to the final symbolic form, in which no relation between the gesture and its meaning could, without knowledge of its history, be seen. The syntax of gesture language reveals the nature of primitive thinking, and from the further development of language the subsequent development of thought can be discovered.

79. Collective psychology. What the genetic psychology of peoples is to anthropology and ethnology, collective psychology is to sociology. We have, then, to discuss the psychological aspects of social organization. In the consideration of the general problems of social grouping there arise such questions as: Why do men and animals associate in groups? What is the psychological relation of the individual to his group? Is there a collective consciousness over and above the individual consciousness? What is the psychological aspect of different forms of social grouping, such as

the family, the club, the clan, the caste, and the nation? These questions we shall consider in order.

It is not easy to say why men live in groups and not in isolation from one another. Human societies are old, and neither history nor anthropology can furnish any certain evidence as regards the beginning of society. Some animals live in groups and others do not, and this fact has led some students to conclude that some animals, including man, have a gregarious or herd instinct, and that other animals do not have it. This, however, does not help us, because a gregarious instinct is merely a concept which does not explain. Another theory is based upon mutual dependence. In the human family, where the child is for so long a period dependent upon its parents, and in the union of groups of families or of animals for mutual defense or acquisition of food, we have the beginnings of society. This theory has some difficulties; for example, in the family where the dependence is one-sided, some other explanation is necessary.

Neither of these theories shows how the members of a group influence each other so as to bring about social action. They merely explain why the members of a group come together. This influence some other writers explain by the theory of imitation and suggestion, the latter being regarded as the cognitive side of imitation. "Imitation", writes Baldwin, "is another great socialization function. The child, naturally, falls to imitating, and when once this is

begun, it is a veritable copying machine, turning out acts, opinions, decisions, which are based (with more or less correctness) upon models found in his social environment." Although such activities as these may be imitative, animal psychologists are now of the opinion that the instinct of imitation is a doubtful concept, and at the most has a limited range. It cannot serve, therefore, as a general principle. Another theory of this kind is associated with the name of Spencer, and is called the theory of sympathy. Spencer supposes that the feeling of sympathy arises as a secondary motive after animals have congregated for mutual defense. "Among animals led, step by step, into gregariousness, there will, little by little, be established a pleasure in being together—a pleasure in the consciousness of one another's presence." This 'pleasure' is, however, now considered as nothing more than a feeling of 'restlessness' which occurs when the individual is in an unusual situation. Dunlap has recently proposed desire as a primary determinant of social behavior. Desires are of many kinds. "Alimentary, excretory desires, desires for rest, desires for activity, desires for shelter, desires for preëminence, desires for progeny, and desires for sex-gratification, in accordance with the types of objects to which the desires are fundamentally referred in the consciousness of the individual." Not all of these desires, as Dunlap recognizes, are social. And the question still remains as regards the origin of social desires.

We must conclude that no one of these theories can serve to explain the origin of social grouping. The motives for socialization are undoubtedly complex, and vary in different species and under different environmental situations. It would seem useless, therefore, to attempt the discovery of any single principle of socialization.

Turning, then, to the human individual we may ask: What, from the point of view of empirical psychology, is the social experience? There are some writers who consider this question the most important in social psychology. They place the emphasis on the individual as a personality, and regard the social environment as a stimulus to which the personality reacts. What we have called the social experience consists, for these writers, in the responses, the behavior which the personality makes. For other authors, the social experience of the individual is an awareness. It seems to be correlative with self-consciousness and is, therefore, a meaning, a particular reference, either to some other individual, or to a group. This reference, according to Bentley, may be characterized as a sharing, a possessing, and a personalizing. Whenever, for example, I have the consciousness of possessing or of sharing an object with another, or am conscious of my relation to an individual or a group of individuals, whether the relation is strange or familiar, old or new, pleasant or unpleasant, I am social. The object shared may be

anything—a book, a work, a dinner, a landscape, a walk in the fields, a topic, a creed, a political issue, a membership, a desire to win.

We have next to face the question, whether there is a collective in addition to the individual mind. We have already seen that a 'folk-soul' was conceived before psychology attacked the problem of the social group, that Lazarus and Steinthal retained this conception, but were unable to find any laws of the folk-soul which were not in the individual, that Wundt, also, conceived of the collective mind in the sense that the social group, as the result of interaction among individuals, creates products which are "inexplicable in terms merely of individual consciousness." Similar views have more recently been expressed by Le Bon and McDougall.

It is true that individuals in a group may think, feel and act quite differently from the way in which they would think, feel and act in isolation, and that the life of the social group may be longer than that of any individual composing it. Furthermore, the group may be said to have opinions, memories, moods, passions, temperaments, aims, desires; to plan, deliberate, resolve, and act. The group may, therefore, have a mind in the empirical sense; mind being the general term for all these social activities. The concept has, however, fallen into mistrust because it has been regarded as an entity and explanatory powers have been ascribed to it.

There remains to discuss the types of social organization, and we may, for convenience, divide them into two classes. First, those which are loosely organized, and which depend, primarily, upon the inclination of the individuals composing it. Secondly, those into which the individual is born and which, consequently, bring to bear a certain compulsion for socialization.

Types of the first kind have been characterized by Bentley. The simplest form, is (1) *The aggregation.* This is nothing more than a sum of individuals, as for example, the group walking along the street. It tends to become social, but no more. (2) *The crowd.* The group now is, temporarily, and casually, integrated by some fortuitous circumstance—a fire, an accident, a holiday. These various factors bring the individuals together with a common perception or instinctive interest. (3) *The congregation*, or audience. Individuals now associate for a common purpose, and are 'polarized' by the speaker, the performance, the worship. (4) *The sympathetic group.* Here the individuals are organized by a bond of sympathy or sentiment, *e. g.*, political parties, churches, secret societies. Other types could probably be made out, but the foregoing will suffice to show that organizations like these are united by some perception, interest, topic, or sentiment which is common to their members.

The second class of organizations comprises the

family, the community, the totemic group, the clan, the tribe, the state, and the nation into which the individual is born. The individual finds a language, beliefs, customs, and manners, which are imposed upon him by the group, and which tend to fix or solidify his social attitude. This type of organization is, therefore, more highly integrated, and it not infrequently happens that the life and interests of the group outweigh, in importance, the life and interest of the individual.

Supplementary Readings for Chapter XIV

Paragraph

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79. M. Bentley, *The Field of Psychology*, 1924; M. Ginsberg, *The Psychology of Society*, 1921, 15 ff., 46 ff., 128 ff.; W. McDougall, *An Introduction to Social Psychology*, 14th ed., 1921; *The Group Mind*, 1920; K. Dunlap, *Social Psychology*, 1925, 16; J. M. Baldwin, *The Individual and Society*, 1911, 20 f.; H. Spencer, *The Principles of Psychology*, ii, 1872, 561; L. L. Bernard, *An Introduction to Social Psychology*, 1926; F. H. Allport, *Social Psychology*, 1924; R. H. Gault, *Social Psychology*, 1923; C. A. Ellwood, *Introduction to Social Psychology*, 1917.

CHAPTER XV

APPLIED PSYCHOLOGY OR PSYCHOTECHNOLOGY

Applied psychology is evidently to be classed with the technical sciences. It may be considered as psychotechnics, since we must recognize any science as technical if it teaches us to apply theoretical knowledge for the furtherance of human purposes. Like all technical sciences, applied psychology tells us what we ought to do if we want to reach certain ends.—HUGO MÜNSTERBERG.

80. The theory of 'applied psychology'. Of recent years there have appeared numerous books and journals in various languages, with the term 'applied psychology' in their titles. In our study of science and technology, we found that those bodies of knowledge and practice which are sometimes called the 'applied sciences', were unhappily named; they are not at all the mere applications of the methods and results of any one or of several sciences. They have, on the contrary, theories, problems, methods, and results of their own; and although they are not sciences in the strict sense of the term, they are correlative to science. For these, and still other, reasons we called them technologies. We have now to ask whether 'applied psychology' is a technology.

A technology, it will be recalled, can be defined

neither by subject matter nor by point of view, but by its aim or goal, which is always a practical object. The knowledge which it employs is drawn from many different sources; but its general theory has a relation to the theory of some particular science—that of mechanical engineering to physics, that of agriculture to biology. Furthermore, every technology devises particular theories for practical objects. These theories are deductions from scientific laws, from the results of its own experimentation, or from any other knowledge that is useful. The theory is then applied to the object; it is put to the test. This requires norms and rules which every technology must determine for itself. Its experimental investigations are of two kinds—those which furnish data for theory, and those which supply the necessary rules and norms. The test of applied psychology, as regards its relation to technology will, therefore, lie in its theory, its methods, and in the nature of its problems. Let us see, then, what 'applied psychology' is.

Poffenberger indicates four periods in the history of applied psychology. In the first, "persons were accustomed to make use of very vague notions of the workings of mind in the problems of daily life," such as, for example, "that one cannot work as well when tired as when rested, that the memories of some people are better than others, that some persons are stupid and others bright." In the second period attempts were made to apply directly the results of experi-

mental psychology to practical problems. "For instance, education took over directly the experiments in memory, imagination, attention, etc., and tried to use them in solving educational problems." In the third stage, "Practical problems themselves were studied, and the actual situations form the material of the experiment. For example, in order to test the memory of individuals for advertisements, the tests were made with actual advertisements instead of the abstract material commonly employed in the psychological laboratory. Finally, in the fourth period experiments were "begun independently of psychology and under the name of efficiency engineering. It consists, mainly, of the analysis of varying tasks into their essential elements and then adapting human behavior to them in such a way as to produce the greatest output with the greatest economy of effort."[1]

It will be noticed that in this statement of the history of 'applied psychology', a theory of mind or of the organism is implied throughout. "Workings of mind," memory, imagination, and attention that can be used in the solving of problems, a memory that may be tested, and an efficient organism, are conceptions that cannot be taken for granted; every one rests upon some theory of conduct. The terms are those of empirical psychology. The 'vague notions'

[1] A. T. Poffenberger, *Applied Psychology: Its Principles and Methods*, 1927, 13.

of the first period may have come, as Poffenberger suggests, from common sense; but we have already seen that empirical psychology regards its conceptions as the same in kind as those of common sense, and we may, therefore, consider the theory of the first period as empirical. In the second period, when the results of experimental psychology were applied directly to the solution of practical problems, it was taken for granted that the laws of memory, imagination, and the like, were laws of practice; otherwise the attempt to apply the laws of psychology would not have been made. Furthermore, empirical psychology also, as we know, considers its laws as practical; it aims at knowledge that is useful. The theory of this period was again that of empirical psychology. The third period is marked by a change in method or materials, not in theory; the concept is unchanged. When, however, in the fourth period, experiments were " begun independently of psychology and under the name of efficiency engineering " interest centered upon the behavior of the individual, not in the sense of mental but of bodily behavior. Psychology was not at that time ready with a conception of this kind, and it is significant that these experiments were begun outside of psychology. It is also significant that at the present time efficiency engineering has ample warrant in more than one psychological theory of conduct and that now, as Poffenberger says, " much of this efficiency research has been accepted as invaluable

by the applied psychologist." Psychology is again furnishing the theory of applied psychology.

We have earlier found that empirical psychology is, in intention, technological theory. It undertakes to supply a theory of conduct that is practical, but it does not attempt to apply its theory in any methodical way. What 'applied psychology' seems to do, therefore, is to furnish the methodical way of applying the theory that empirical psychology offers. Apparently, we may either consider 'applied psychology' as the application of the theory of conduct laid down by empirical psychology, or regard empirical psychology as the theory, and 'applied psychology' as the practice of a psychotechnology. The latter implies, however that 'applied psychology' has developed the special problems and methods which are characteristic of a technology. What is to be said of them?

The individual with whom 'applied psychology' now deals is the plain man that we have already met, first in the chapter on individual differences, then later in our study of the psychology of the abnormal, and still later in the discussion of individual development. This individual constitutes, as it were, the raw material of the discipline; it is he that is to be trained, educated, controlled, and made efficient. It is he that must be tested, measured, and compared. Training, control, and efficiency of the individual are then its general goals. The particular problems and methods

are, however, directed toward particular goals. There are, therefore, several branches of 'applied psychology', and we must consider these branches separately. We begin with educational psychology.

81. Educational psychology or experimental pedagogy. The particular division of 'applied psychology' which finds its problems in education had its origin in the invention of one of its most important tools, the 'mental test.' The term "mental tests" was first employed by Cattell in 1890, but tests of a simple kind had been devised by Galton a decade earlier. It was, however, the invention of the intelligence test in 1895 by Binet and Henri, and its subsequent development by many investigators, that set educational psychology, and indeed all applied psychology, on its feet. The activities of educational psychology center, of course, about the problem of learning. Experimental Education, however, does not ask what should be learned, but rather how can the individual best learn the material or the habits which Education at large decides should be learned. Exactly what constitutes learning is still a matter of debate; and in our study of animal psychology and of individual development we have already come into contact with some of the theories. In so far as Experimental Education is concerned, all theories require first a knowledge of the original nature of man, and also of the nature of an individual. In other words, the first

step is to determine the capacity of the individual—not only of a generalized but also of the particular individual. This double problem is finding its solution in experimental studies of the infant, and in the study of 'traits' which we have already examined in the chapter on Differential Psychology. Secondly, Education must also know the laws of psychophysical development, the laws of growth which we have discussed in the chapter on the Development of the Individual. Thirdly, Education must investigate the special conditions of efficient learning. Apart from a general condition, the innate capacities of the individual, there are other special conditions which may be grouped under the phrase "hygiene of instruction." What, for example, is the effect upon the learning process of temperature, humidity, illumination, and other environmental factors; and how can they be controlled to give the best efficiency? Again, what is the influence of fatigue upon learning, how can it be reduced, and what periods of rest are necessary to produce the best quality of work in the least time? Or, once more, what are the effects of malnutrition, of defective eyesight and hearing, of adenoids and diseased tonsils, and the like. A fourth set of problems concerns the progress of learning itself. What, for example, is the rate and progress of learning? What is the effect of distraction? What are the best methods of presenting the materials of various subjects, or of developing habits of different kinds? To

what extent may efficiency or activity in one subject be transferred to another? A fifth problem concerns the discovery and standardization of methods for the measurement of efficiency in learning. The solution of these problems often requires much knowledge that is not psychological. The investigator is led into physics, chemistry, biology, eugenics, medicine, physiology, illuminating engineering, architecture, and still other branches of knowledge before a certain practical problem can be attacked. His experimental investigations are, therefore, of two kinds: in the one he employs the procedures of science for the determination of new knowledge, and in the other he employs mental tests to determine individual differences, the conditions of learning, and the rules and norms for practice.

Educational psychology has, therefore, its own particular problems, and it has devised methods for their solution. It is dependent in large measure upon the theory of empirical psychology, and books on Educational Psychology discuss the special aspects of general theory with which it is concerned. In addition to the knowledge which it gains from its own experiments, it draws upon other sources for information which it can put into practical use. Thus, Educational Psychology is something more than the mere application of the results of psychology to educational problems; it has the characteristics of a technology.

82. Economic psychology. A second branch of 'applied psychology' is concerned with a number of problems which relate to industry and the market. Its central problem concerns the efficiency of the individual in relation not only to his particular task, but also to the industry or market as a whole. The innate tendencies, the effect of the surroundings upon work, and the 'personality' of the individual are again, as in education, important for efficiency; but in addition to these there are many special factors which give rise to new problems. One of the most important of these is called vocational selection; the discovery of the individual who is best adapted to a particular task. Another problem relates to the most effective application of effort in the performance of a task. Still another concerns efficiency in advertising and in salesmanship. There are, of course, also others which have to do with general management and organization of factory and shop. Our primary interest, however, is in the nature of the solution of these problems, and we may best proceed by taking typical instances.

Let us begin with vocational selection, and let us suppose that of a hundred applicants we have the task of finding the thirty individuals best suited to a position. The first thing that the applied psychologist does is to analyze the position itself; that is to say, he tries to find the particular traits that the task requires for its performance. The second step is to find a series of tests that will measure these traits. The third, is to

give these tests to two or three groups of employees who are already performing the task. One group consists of those who are most efficient; another of those who are least efficient; and perhaps a third group who have shown only average ability. The fourth step consists in the comparison of the scores thus obtained by groups. If, for instance, the task has been properly analyzed, and if the tests chosen are adequate, then we should expect that the first group would have high scores, that the second group would have the lowest scores, and that the third group would have average scores. If this should, in fact, be the result, the test may then be given to the hundred applicants, and the thirty who score highest will be selected. In practice, the tests themselves will undergo further trial by the way in which the thirty applicants selected succeed in the performance of the task. Eventually, the tests may serve for the future selection of individuals for this particular task.

This same type of experiment is used also in the selection of salesmen, but the general problem of salesmanship is much broader, and includes a study of many psychological factors such as attracting the attention and the interest of the prospective purchaser to his merchandise, convincing him of its merits, and finally persuading him to buy it. Advertising also involves these psychological questions. The advertisement must itself attract attention, gain the interest, bring about conviction, desire and,

finally, a purchase. In advertising, however, there are many factors which may be measured and reduced to rule, such as, for example, relative size, position, color, typography, frequency of repetition of the advertisement, and the medium (newspaper, magazine, street car) in which it appears. Here the laws of the empirical psychology of attention and interest furnish the theoretical, and the average responses of a large number of individuals to the various forms of advertisement supply the quantitative, basis for the solution of the problem.

The methods required for finding the most effective application of effort in the performance of a task are quite different from those we have just discussed. They depend, of course, in part, upon the nature of the work. We may take, as an instance, what is technically called "motion study". The applied psychologist first analyzes the movements required to do the work, and then tries to eliminate wrong movements and to make more rhythmical the correct movements. An expert is sometimes able to solve the problem by mere observation. In other cases, however, elaborate mechanical devices for the analysis of movement are necessary. The general procedure is to photograph the movements made by an individual with stereoscopic cameras, and then to construct wire models of the correct movements to be made, and to employ these both for the further analysis of the motion and for the instruction of the

performer. Special methods have also been devised for testing special capacities such as those needed by automobile drivers, motormen, telephone operators, and many others.

83. Juristic psychology, or the psychology of evidence and testimony. Since 'applied psychology' and the law are both interested in the control of the individual, the former should be able to solve certain problems that concern the administration of law. In this field, applied psychology is interested in eliciting evidence, in the evaluation of testimony, in the determination of responsibility and in certain aspects of punishment or other corrective measures. The first of these problems has been attacked by what is technically known as the free-association method. It consists in determining the verbal responses and the reaction-times of suspected individuals to a series of words, of which some have a relation to the crime (the critical words) and others have no such relation. The individual, then, is told that he will be given a word, and that he must reply with the first word that comes to mind. Both the reaction-word and the time of the response are recorded. The individual may betray himself either by the nature of the verbal response to the 'critical word' or by an increased length of the reaction-time. The experiment has proved successful in some instances but it does not, of course, furnish evidence for conviction. In the second prob-

lem, experimental investigation has been directed, to the variation in range and degree of accuracy of testimony, to the effect of suggestion by way of leading questions, and to the degree of accuracy with which a correct account of an event may be constructed from conflicting evidence. The general method is to present to a number of individuals a group of objects, a picture, or an enacted scene; and, after an interval, to require the observers to give an account, by way either of narrative or of replies to questions, of what they have seen. It is possible, then, to compute the relative number of errorless reports, the relative accuracy of the narrative as against the interrogatory form of report, the effect of time interval between the event and the report, the effect of age and sex on the accuracy of testimony, and the like. Juristic psychology has, perhaps, been of more assistance to the courts in the determination of responsibility than in any other way. The question here is whether the individual is feebleminded, insane or in any other way irresponsible. By the use of mental tests and other methods of clinical psychology, responsibility in this sense may be determined. Similar methods are employed to assist the court in determining the proper corrective measures.

84. Medical and clinical psychology. In this branch of 'applied psychology' there are two types of problems. The first belongs to 'preventive medicine' and consists in a study of the psychological factors

involved in teaching and overcoming resistance to preventive measures, and also of the environmental conditions which in part bring about mental disorders. The second kind of problem concerns the study of the psychological aspects and the diagnosis of mental diseases. For the latter, tests of intelligence, of emotional stability, of association of ideas, of sensory discrimination, and of behavior responses are mainly employed. These tests are also used in the 'psychological clinic' where psychologists, in collaboration with social workers, investigate the defective and delinquent who are brought into the clinic for examination. Medical psychology has also investigated the effects of various drugs on the behavior of the individual, and the use of hypnotism, suggestion, and other psychotherapeutical methods of healing.

This must suffice for an account of the problems and methods of applied psychology. We set out at the beginning of this chapter to discover the relation of applied psychology to technology; and we have found (1) that applied psychology has no theory of its own, that it applies the theory of empirical psychology; and that we may regard applied and empirical psychology taken together as a technology provided that in other respects applied psychology in its various branches shows the characteristics of a technology. In an investigation of this latter question we have further seen (2) that every one of these branches has its own practical objects, its particular problems, and

that it has devised methods for the solution of these problems. Furthermore, every one draws upon other sources than psychology for knowledge that may be of service in attaining its practical end or object. All of these are marks of a technology. We seem, therefore, to be justified in considering empirical and applied psychology as together constituting a psychotechnology. The prefix, psycho-, will serve to distinguish the technology of human conduct from that based on physical theory, to which, for example, mechanical, electrical, and chemical engineering belong, and from that based on biological theory, important branches of which are agriculture, eugenics, and medicine.

There are, of course, other applications of the theory of conduct that have not yet reached the technological stage, such as, for example, in the fields of æsthetics, in the normal adjustment of the individual to his social environment, and in everyday life. Psychotechnology is a product of this century, and there can be little doubt that it will, in years to come, extend its activities in these and still other directions.

Supplementary Readings for Chapter XV

Paragraph

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CHAPTER XVI

THE STATUS OF PSYCHOLOGY

By mutual confidence and mutual aid
Great deeds are done, and great discoveries made.—POPE'S *Iliad.*

There are two different conceptions of psychology considered as science. The one which we have called empirical psychology aims at a useful theory of conduct. The other, which we have called existential psychology, undertakes a description of the world of experience from a particular point of view. They reflect two different attitudes which men of science have taken toward the world, and two different opinions about the meaning of science. Although these two attitudes and opinions may be traced throughout the history of science, their logical formulation is comparatively recent. We have designated them as the traditional and the critical conceptions of science.

Traditionally, the aim of science is a theory of the natural world that will make explanation and prediction possible and thus bring the world under control. Its method is one in which observation is ancillary to logic, and its knowledge is more accurate than but otherwise no different from that of common sense. Its world is a 'world of appreciation,' a world of values, of knowledge that is useful. Its fundamental question is Why? and its answer is an explanation.

According to the critical conception, the aim of science is the description of the natural world. The logical limitations of science so regarded preclude the possibility of explanation in the sense of causative agency. Its method is one in which logic is ancillary to observation. Its knowledge is not the same as that of common sense, but consists of facts stripped of values. Its world is a 'world of description,' a world of facts, of knowledge that may perhaps prove to be useful but is sought without regard to its use. Its fundamental question is What? and its answer is a description.

Existential psychology represents an overt attempt to found a psychology in agreement with the critical conception of science. According to this view, science can properly deal only with those aspects of the world of experience that are directly observable. The particular aspect with which existential psychology deals is conditioned upon the organs of sense and their connections in the brain. Its subject-matter turns out to be sensory experience; but existential psychology studies sensory experiences in their own right, without regard to their meaning, while empirical psychology considers them as meaningful.

Modern empirical psychology grew out of and conforms to the traditional notion of science. It has as its particular aim a theory of human and animal conduct. It began with a new attack upon the problem of mind. Instead of speculating about the nature and the prop-

erties of the soul, it undertook the analysis, classification, and explanation of mental phenomena, which it regarded as the activities, the expressions, or the manifestations of mind. Its aim was a theory of mental conduct which would throw light upon certain philosophical problems and, incidentally, explain human behavior. Its theory was therefore limited to the conduct of the human individual, and in particular to his mental conduct. Of recent years its theory has been restated in terms of both mental and bodily conduct, and in terms of bodily conduct alone. At the present time the subject-matter of empirical psychology at large admits of a threefold division: first, sensory experience—for, although it is occasionally recognized that sensory experiences may occur without meaning, they are usually taken as meaningful, or by virtue of mental activity they become meaningful and thus subject-matter of empirical psychology; secondly, mental activities, states of consciousness, configurations, or mind-body functions; and thirdly, bodily behavior.

In order to reduce this subject-matter to its simplest terms, let us take a concrete case: a human organism stimulated by a wave-frequency of 256 vibrations and of sufficient amplitude to excite an audible experience. The audible experience, taken as such, may be observed and described in the critical sense of science; it then becomes subject-matter of existential psychology. The same experience, moreover, may bear a meaning:

it may mean 'tuning fork,' or it may be interpreted as some other object; it may mean 'beautiful,' 'pleasurable,' 'disagreeable,' or it may be evaluated in some other way; it may also give rise to meanings which explicitly involve the self. These interpretations, evaluations, meanings, cannot be observed in the critical sense; but as ways in which mind is useful, they belong to empirical psychology. Meanings constitute the aspect of experience which underlies such concepts as states of consciousness, acts or functions of consciousness, mind-body functions, configurations, mental responses, or mental behavior. Finally, the organism not only has the audible experience which may carry meaning, but it also moves. The movement may be a change in the rate and form of heart-beat or respiration, a contraction of muscle in the ear, a glandular secretion, or a gross movement of approach or withdrawal.

These three divisions of psychological subject-matter are interrelated. Sensory experience, at least when patterned, has meaning. Whether the converse is true, whether all meaning is correlated with some sensory experience, is not yet clear. There is also a correlation between movements and meaningful sensory experience. Indeed, there is much evidence for the view that "the whole of the inner life is correlated with and dependent upon bodily movements;"[1] the latter, however, may occur without the former. Whether bodily movement

[1] M. F. Washburn, *Movement and Imagery*, 1916, xiii.

is to be regarded as a correlate of sensory experience alone or of meaning alone, is not certain.

In view of this interrelation, the question arises whether any psychology is justified in ignoring any one of these three divisions of psychological subject-matter. The answer depends upon the goal in view. If psychology is to be a science in the critical sense, it must of necessity be limited to the description of sensory experience. This follows from the fact that, since behavior as such is already subject-matter of biology, no other subject-matter of psychology at large is, in the critical sense, observable. Existential psychology must, therefore, be a study of sensory experience; everything else it must ignore. This does not mean, however, that empirical psychology—whose goal is a theory of conduct—may not find the descriptions of existential psychology useful. Not only does the history of science show conclusively that knowledge sought for its own sake, without consideration of its usefulness, has nevertheless proved useful; but it also teaches that, as descriptive science is carried further, empirical science makes advances in new and unexpected directions. Furthermore, just as the history of science has repeatedly shown that descriptive science gains new problems and new insights from empirical science, so existential psychology may draw in the same way upon empirical psychology.

If psychology, on the other hand, is to furnish a theory of conduct, it may not neglect any of the divi-

sions of psychological subject-matter unless, despite this neglect, its theory of conduct is fully adequate to all the demands made upon it. Behavioristic psychology claims that its point of view can furnish a theory of conduct that will be adequate to the purpose Whether the future will prove this claim to be true remains to be seen. In the light of our present knowledge the promise for the future is not justified. A behavioristic account of many psychological problems would not furnish all the knowledge necessary for a complete theory of conduct. For example: the perception of objects as near and far, the perception of size and form of objects, the perceptions of time, movement, rhythm, and melody, provide the molds for a large share of human thought; wants, desires, ideals, aspirations, strivings, are fundamental to an understanding of the motives which underlie human endeavor. A behavioristic account of these perceptions and conations omits those modes of conduct which underly our logical and ethical thinking and our æsthetic appreciation. The consciousness psychologies are equally incapable of furnishing a complete theory of conduct. For much of the behavior which such a theory must account for is instinctive, reflex, unmotivated, unreasoned, indeed often opposed to reason; and in order to explain such behavior the consciousness psychologies have been forced, in their theories, to fall back upon hypothetical determinants of a purely mental kind.

What is needed, therefore, is an empirical theory

that will embrace all three divisions of psychological subject-matter. This seems to be the trend of the more recent theories. One theory seeks to avoid the difficulties of the consciousness psychologies by substituting a theory of mind-body performance. Another theory tries to overcome the shortcomings of both the consciousness and behavioristic psychologies by postulating responses-to-stimulus of both a mental and a bodily kind. Still another theory, one not yet completely formulated, undertakes to do away with the concept of mental activity and deal only with mental and physiological patterns or configurations. The theory ultimately acceptable will conform to all that can be known of the subject-matter of psychology from every point of view; it will avoid explanations in purely conceptual terms; and it will be adequate to the requirements of philosophy, anthropology, sociology, economics, history, the fine arts, the psychotechnologies, and the problems of everyday life. The acquisition of such a theory will require the labor of many individuals working together with "mutual confidence and mutual aid," although any one may limit himself to that aspect of the whole for which, by temperament and training, he is best fitted.

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